FLYING
including INDUSTRIAL AVIATION
OCTOBER
25¢
COLOGNE RAID by an RAF Officer
LATEST AIR-WAR PHOTOS
I HAVE FLOWN WITH THE JAPS by Lawrence Impey

"I Saw The *Car* in Wichita That You'll Be *Flying* Soon"

CAPTAIN FRANK J. WADDELL, American Airlines million-miler in the air, and a full-fledged farmer on the ground, tells what he sees ahead for the farm folks of tomorrow.

"As tires, gasoline and cars get scarcer, the farmer's road to town is stretching like a rubber band," says Captain Waddell. "But as sure as you're born, the cities and towns will all come *flying back* when this war is over, closer to the farm than ever. Then, a 100 mile drive in your own *Family Car of the Air* will be easier and quicker than a 25 mile trip today.

"You see, they're packing years of progress into hours at the Cessna plant in Wichita . . . building airplanes for Uncle Sam and our allies. And when you add that experience to the 31 years Cessna already had in aviation . . . it's easy to see why this Family Car of the Air is here at last . . . ready to be built for you as soon as this war is won."

A New Line of Headaches For Hitler

We're *laying 'em on the line* like this every day at Cessna. They're twin-engined Bobcats for the U.S. Army Air Corps . . every one a headache for you, Herr Hitler! And there's another line of Cessna Cranes rolling out to the British Empire Training Program.

The steady roar of those Bobcats and Cranes, flying over 4 million miles a week in bomber-pilot training service, should mean a twin-engined headache for the Axis. And we're working 24 hours a day at Cessna to make good and sure it does.

FREE *"Keep 'Em Flying" Wings*

You get this handsome pair of Anti-Axis Wings plus a clever Jap Hunting License absolutely free if you send 10 cents for a United States War Savings Stamp now to . . .

CESSNA AIRCRAFT COMPANY, Dept. FPA, Box 1616, Wichita, Kan.

Nothing's Going To *Keep 'Em Down On The Farm*

. . . when folks like these can fly their own Family Car of the Air as easily as they drive their automobile today. Vacation trips—almost unheard of for the farmer because he can never spare the time—will be week-end jaunts to *all America*. Saturday's shopping can be done in a couple of hours in cities three or four hundred miles away.

Hard to believe? Not if you could eavesdrop on the aviation experts as they leave Wichita these days. For, at Cessna they're seeing the inspired answer to all the things that have stood as the last barrier to flying-for-the-millions . . . the Family Car of the Air, designed by the same brilliant engineering department that has already given to *professional* aviation the famous Cessna Airmaster, three times judged the *World's Most Efficient Airplane.*

COPR. 1942, CESSNA AIRCRAFT

Cessna

SYMBOL OF *Aircraftsmanship*

FOR THIRTY-ONE YEARS

PARKS *"Learn-By-Doing"* LEADERSHIP TRAINING

Includes Actual Student Airline Operation

Commercial Airline Operation is no mere textbook study for the students of Parks Air College. Undergraduates in the Aviation Operations and Executive Course round out their training by applying their knowledge and developing their skill in actually operating the Parks Student Airline.

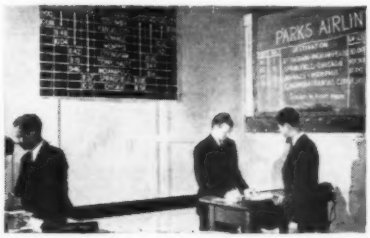
The pictures below illustrate some of the many operating and technical phases planned and executed by Parks students themselves.

Practical training in a well-equipped room follows 480 class hours of study in Airline Operations.

As soon as the passenger's desires are known, the *Reservations Agent* plans the best possible schedule.

***Reservations Control* in confirming a space request effects the best utilization of available seats.**

***The Ticket Office* obtains necessary passenger data, sells tickets, checks baggage weight and, in general, takes care of passenger requirements.**



***The Passenger Agent* handles all passenger problems, checks passenger list with the steward, and at times acts as dispatcher in clearing the plane.**

***Segregation and Listing of Cargo* must be carefully executed. Manifests are made out, weight determined and relayed to other stations.**

Clearance for the flight can be given only after the Meteorologist and Flight Superintendent have analyzed route flight conditions.

***The Pilot*, after getting final clearance, goes to his plane where the *Co-Pilot* has checked radio, instruments, and controls.**

***The All-Clear Salute* is given the pilot by the station agent. The pilot is now on his own and will receive further instructions by radio en route.**

PARKS AIR COLLEGE, East St. Louis, Illinois

★ PARKS AIR COLLEGE was founded August 1, 1927. Has enjoyed full Federal approval longer than any other aviation school.

Is accredited in its Aeronautical Engineering School by the Illinois Superintendent of Public Instruction.

Included since 1938 in The Directory of Colleges and Universities, issued by the United States Office of Education.

Has a capacity enrollment of 325 commercial aviation students, also detachments of U. S. A. Air Forces Aviation Cadets and Mechanics. Has its own airport with a school plant of 25 buildings devoted to school purposes entirely, also a group of satellite fields for military flight training.

Has a faculty of 104, each especially qualified for his particular field of instruction.

Open to high school graduates with a ranking in the upper two-thirds of their classes.

If you would like to receive further information on Parks Leadership Training, send the coupon for the free Parks 64-page catalog at once.

PARKS AIR COLLEGE Section PA-10
East St. Louis, Illinois

Please send me details of four major courses in commercial aviation training.

Name..... Age.....

Address.....

City..... State.....

FLYING

VOLUME XXXI — *including* INDUSTRIAL AVIATION — NUMBER 4

Contents FOR OCTOBER, 1942

PRODUCTION
The Kaiser Plan ... William B. Ziff 19
Production—Our Home Front ... William B. Stout 31
Women Workers Wanted! ... Brig. Gen. Frank J. McSherry 34
Plane Short Cuts ... Kurt Rand 38
Victory Weld ... Paul Pierce 46

ENGINEERING
It's Done with Mirrors ... Lewis Tansky 28
Computation by Nomograms ... Raoul J. Hoffman 54
Preventative Maintenance ... R. J. Curry 55

MILITARY AVIATION
War in the Air ... 20
Air Pick-up Goes to War ... Rep. Jennings Randolph 26
Cologne Raid ... Sq. Ldr. J. DeL. Wooldridge 30
The Ramming Russians ... Lieut. Robert B. Hotz 32
The Inoffensive Battleship ... Cy Caldwell 33
I Have Flown with the Japs ... Lawrence Impey 41
Why French Aviation Failed ... Maria de Blasio 47

TRAINING
Down to the Sea in Blimps ... Ens. Earl E. Burton 24
Putting the Power in Manpower ... H. R. Ingraham 48

PRIVATE FLYING
Private Flyers to the Rescue ... Russ Johnston 44

WASHINGTON
From Headquarters ... Lieut. Col. Harold E. Hartney 42
The Billy Mitchell Case ... Rep. Melvin J. Maas 43

MEDICINE
Age and the Fighter Pilot ... Col. Malcolm C. Grow and Lieut. Col. Harry G. Armstrong 49

COMMERCIAL AVIATION
Air Mail Everywhere ... Francis D. Bradbrooke 29

PERSONALITIES
Pat ... Ray Nathan 40

DEPARTMENTS
For Identification ... 35
Air Services Section ... 50
Have You Seen? ... 52
I Learned About Flying from That! No. 39 ... John P. Gaty 56
Industrial Aviation Section ... 69
Letters ... 98

Cover photograph: Vultee BT-15 by U. S. Army Air Forces

★ ★ ★ ★ ★

WILLIAM B. ZIFF
Editor and Publisher

B. G. DAVIS
General Manager

MAX KARANT
Managing Editor

DON RYAN MOCKLER
Associate Editor

HERMAN R. BOLLIN
Art Director

GEORGE BERNER
Advertising Manager

H. G. STRONG
Circulation Manager

Copyright, 1942
ZIFF-DAVIS PUBLISHING COMPANY
Editorial Offices: 540 N. Michigan Ave., Chicago, Ill.
Member of the Audit Bureau of Circulations

★ ★ ★ ★ ★

FLYING is published monthly by Ziff-Davis Publishing Company at 540 N. Michigan Ave., Chicago, Ill. New York Advertising Office, 270 Madison Ave. West Coast Advertising Representative, William L. Pinney, 416 W. Eighth St., Los Angeles, Cal. Washington Bureau, Occidental Hotel, Lieut. Col. Harold E. Hartney, Manager. SUBSCRIPTION RATES: In U. S., $3.00 per year, single copies 25 cents; in South and Central America and U. S. Possessions, $3.00 per year; in Canada, $3.50 per year, single copies 30 cents; in British Empire, $4.00 per year. All other foreign countries, $6.00 per year. Subscribers should allow two weeks for change of address. Address all subscription letters to the Director of Circulation, FLYING, 540 N. Michigan Ave., Chicago. Entered as second class matter, July 16, 1940, at the Post Office, Chicago, Illinois, under the act of March 3, 1879. Entered as second class matter at the Post Office Department, Ottawa, Canada. Contributors should retain copy of contributions. All submitted material must contain return postage. Contributions will be handled with reasonable care, but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever adaptations and revisions are necessary to meet requirements. Payment covers all authors', contributors' and contestants' rights, title, and interest in and to the material accepted and will be made at our current rates upon acceptance. All photos and drawings will be considered as part of material purchased.

MUST LAUNCH 185,000 WARPLANES

The aviation industry is mustering every facility of the world's greatest industrial civilization to fulfill President Roosevelt's far-sighted demand for 185,000 fighting planes. Because the demand exceeds the supply of skilled aircraftsmen, many inadequately trained men are finding single-phase jobs through cheap "quickie" courses. BUT—the vital supervisory positions can only be held by men with the thorough long range training to reach any objective to which they may be assigned . . . the men who have chosen aviation as a career—not an expedient. They are the only men of this huge production army who are indispensable to America's war effort and who will continue to be indispensable when the aircraft industry steps down from war to peace schedules.

The executives who have made aviation THEIR career know the value of each man is governed by two factors: his intelligent sincerity in selecting aviation as his life work, and THE ABILITY AND EXPERIENCE OF THOSE WHO TRAIN HIM FOR THAT CAREER. They know that Curtiss-Wright Technical Institute graduates are—and for many years have been—thoroughly qualified to fill the industry's exacting requirements.

Located in the very center and a very important part of Southern California's great aircraft industry, with its more than two billion dollars in unfilled orders, Curtiss-Wright Tec has come to be recognized as the nation's leading institution for the training of Aeronautical Engineers and Master Mechanics.

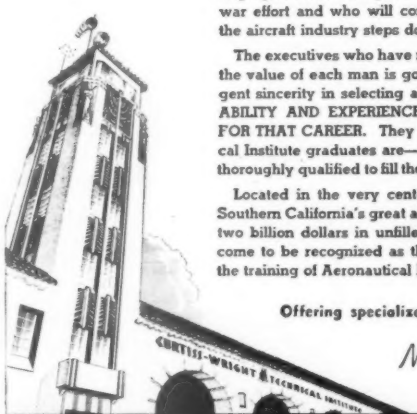
Mr. Donald Douglas, President of the great Douglas Aircraft Company, chose this school for his own son's training, which pointedly indicates the high standing Curtiss-Wright Tec has attained in the aircraft industry since its establishment in 1929.

It is imperative that before you invest in a course of career training you determine what the returns will be on your investment . . . for your choice of a school in which to take your training will determine how much money you will make all the rest of your life.

Curtiss-Wright Tec's career training is carefully designed to do just one thing:—TO MAKE MONEY FOR YOU, so upon graduation you can be independent and self-supporting for life. Our thousands of successful graduates have proven that Curtiss-Wright Tec training gets results and always pays, since it trained them in advance for the highest position they could ever expect to occupy. It can do the same for you.

This school has never guaranteed positions for its graduates, but practically every graduate has obtained immediate employment and is advancing rapidly. The demand for our graduates far exceeds the supply, and we honestly believe that every student who enrolls here will be able to obtain, with our assistance, immediate employment upon graduation.

WARNING!—"Don't miss the boat." The greatest opportunity in your lifetime exists today! There never was such an opportunity in aviation for you: there may never be another. A position awaits you. Insure for yourself a steady income and independence for life. DON'T FOLLOW—LEAD! Send in your enrollment before you "miss the boat."



THIS TOWER OVERLOOKS AVIATION'S MOST DISTINGUISHED SCHOOL OF AERONAUTICS

Offering specialized and proven training in AERONAUTICAL ENGINEERING & MASTER MECHANICS

No Flying Involved

CURTISS WRIGHT TECHNICAL INSTITUTE

GRAND CENTRAL AIR TERMINAL 1225 AIRWAY GLENDALE (LOS ANGELES) CALIF

UNDER PERSONAL SUPERVISION OF MAJOR C. C. MOSELEY, OWNER, SINCE ITS ESTABLISHMENT IN 1929

Contractor to the U. S. Army Air Corps

BE WISE—PROTECT YOUR FUTURE

MAIL TODAY • DON'T DELAY

WITHOUT COST OR OBLIGATION SEND ME FULL INFORMATION AND CATALOG ON THE COURSE CHECKED BELOW

- ☐ AERONAUTICAL ENGINEERING COURSE
- ☐ MASTER AVIATION MECHANIC COURSE
- ☐ SPECIALIZED ENGINE COURSE
- ☐ SPECIALIZED AIRPLANE COURSE
- ☐ SPECIALIZED AIRCRAFT WELDING COURSE
- ☐ POST GRADUATE AERONAUTICAL ENGINEERING COURSE
- ☐ SPECIALIZED AIRCRAFT SHEET METAL COURSE
- ☐ AERONAUTICAL DRAFTING COURSE, HOME STUDY
- ☐ AIRCRAFT BLUE PRINT READING COURSE, HOME STUDY

NAME _____

ADDRESS _____

CITY STATE F-10

in Production and Design

MEETING THE INDUSTRY'S WARTIME NEED

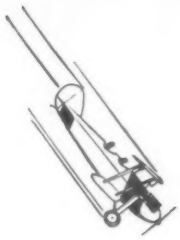
WITTEK *Aviation* **HOSE CLAMPS**

For Leakproof Hose Connections

Working hand in hand with the aircraft manufacturers from the beginning of modern aviation, Wittek Aviation Hose Clamps have long been known as the standard of the industry and are now being used by almost every manufacturer of bombers, fighters, observation scouts and trainers. Wittek Aviation Hose Clamps provide permanent, safe, leakproof hose connections.

THE STANDARD OF THE INDUSTRY

WITTEK *manufacturing* **CO.** ★ 4305-15 WEST 24th PLACE ★ CHICAGO, ILLINOIS



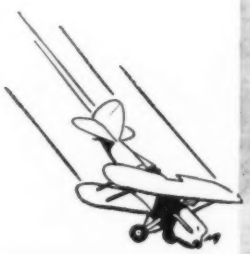


PHOTO BY LAWRENCE LOWRY

IT'S DEPENDABILITY *that Counts*

• In a secondary trainer, it's dependability that counts . . . and Waco's dependability under every weather condition is what makes Waco the outstanding trainer all over the Western Hemisphere.

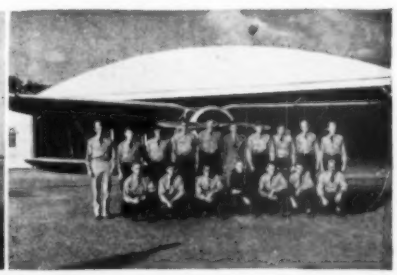
North Aviation, of White Bear Lake, Minnesota, uses Wacos exclusively for secondary and acrobatic work at their Type A training center. Under temperatures ranging from as high as 101° in the summer to as low as —40° in the winter, their Wacos are on the line day after day, training future instructors for our Air Forces . . . combat pilots for Wartime and Airline pilots for peacetime.

You'll find Wacos wherever you find CPTP operations. The Operator KNOWS he can depend on Wacos . . . and to the Operator IT'S DEPENDABILITY THAT COUNTS.

THE WACO AIRCRAFT COMPANY • TROY, OHIO, U.S.A.

Below are two groups of future pilots and instructors at North Aviation. On the left, are Central and South American, and on the right, North American students.

The Wacos are used for secondary, acrobatic and cross country training.



Where the GRAPES OF WRATH are stored!

Bomber quality in workmanship and production has given America something to be proud of, but America needs double the number of craftsmen and specialists — men and women to maintain this supremacy. Are you doing your part?

INSTRUCTORS WANTED!
Flight Instructors, Technical Instructors, Ground Instructors, and Mechanics to help us do the job. Write or wire us your qualifications today.

CIVILIAN STUDENTS CAN STILL ENROLL

Due to certain restrictions, the Embry-Riddle School of Aviation is now offering only intensive mechanical and flight Specialist Courses. We are training our men and women students for leadership in the industry under U. S. Government approval, therefore our classes are small and personalized.

"KEEP 'EM FLYING"

Embry Riddle
SCHOOL OF AVIATION
3240 N. W. 27th AVENUE — MIAMI, FLORIDA

F-1042
NAME_____
ADDRESS_____
CITY_____ STATE_____

RIDDLE AERONAUTICAL INSTITUTE
CARLSTROM FIELD — DORR FIELD
ARCADIA, FLORIDA
RIDDLE-McKAY AERONAUTICAL COLLEGE
CLEWISTON, FLORIDA
RIDDLE McKAY AERO INSTITUTE
OF TENNESSEE
UNION CITY, TENN.
CONTRACTORS TO
U. S. ARMY AIR CORPS — CIVIL AERONAUTICS ADMINISTRATION
UNITED STATES STATE DEPARTMENT — ROYAL AIR FORCE

AIRCRAFT manufacturers—old hands at being told how to build airplanes by people who are not aircraft manufacturers—were tossed another headache last month: cargo planes. Henry J. Kaiser—who not only means well but, we are convinced, could do a spectacular job of building flying boats if there was any point to it—has had his famed proposal on the front page of every newspaper in the country. The public, quick to react to such a plan, set up a clamor heard first by their neighbors, then their congressmen and senators and, inevitably, by production officials in Washington.

But there has been more clamoring than a display of good sense. Many basic, vitally important, facts seems to have been completely overlooked. Mr. Kaiser, for instance, arbitrarily decided on the Martin *Mars*, a huge four-engined flying boat that even Glenn Martin admits is an experiment. Then, it is the carefully considered opinion of most airline experts—who know a cargo design when they see one—that the flying boat probably is the worst type of aircraft for the job. It costs money and valuable fuel to carry around the huge hull—which actually is a full-blown sea-going boat. No matter what size the landplane, the wheels weigh a good deal less than a boat hull, and can be easily tucked away in flight.

Pan American Airways, for instance, all but pioneered the flying boat as a long-range weight-carrying aircraft. A cargo plane, in other words. But Pan American engineers decided several years ago that landplanes are far more economical and efficient for long-range overwater flying. All new types ordered by Pan American are landplanes.

As to land cargo types, there again some obvious facts have been overlooked. The Army and Navy operate—and have for many months—the world's most gigantic air cargo system. The airliner in which you flew yesterday might well be in Greenland, Hawaii or Alaska tomorrow. Douglas DC-3's from the nation's domestic airlines have been doing this flying for a long time—and doing it so efficiently that the Army will take all the new ones they can get, despite the fact that the DC-3 is seven or eight years old. Then there are the large numbers of Douglas C-54's (DC-4) and Curtiss *Commandos* (C-46) also flying to all parts of the world every day.

Has any phase of the cargo plane program been delayed? Yes—in the same manner as has our bomber and pursuit plane programs. A twin-engined cargo plane is no good if just one engine or one tire is allocated to it. Neither is a fighter.

What progress with cargo planes has been made? The Army more than a year ago completed plans and let contracts in a manner just as unconventional and spectacular as is advocated by Mr. Kaiser. Many wood-working factories will be producing wood-and-metal freighters either whole or in sub-assemblies. Nearly every important piano and furniture factory in the country has been working on this program for some time.

Although this work has been publicized hardly at all, it's much farther toward being a reality than the Kaiser plan.

* * *

BRITISH aviation publications do not appear to be operating under the same set of restrictions as apply to their American contemporaries. For example, we often find information regarding American military and Naval aircraft first published by the British prior to authorized publication by the American press. Naturally, once the information is made public by our English allies, it is then available to American aviation and our own aviation reporters.

For instance, one of the latest and best British publications dealing with aircraft identification is a gold mine of information about American aircraft about which we Americans officially know very little. The U.S. Navy's Grumman *Wildcat* fighter (*Martlet* in England), we learn, has a top speed of 325 m.p.h., range of 1,150 miles at 285 m.p.h., gross weight 5,876 pounds, and so on. The Lockheed P-38, the British tell us, has

(*Continued on page* 117)

OVER the seven seas bad news is winging to the enemy who thought America too soft to fight.

He's had an inkling of it already over New Guinea, Tokyo and Midway Island, and he found it gall.

At bitter cost in ships and planes and men he's learned what a mere handful of American fighters and bombers can do against tremendous odds.

Yet these were but the vanguard—the skirmishers of our first line of offense now marshaling on a dozen fronts to smite him wherever he may be.

For today America is building more airplanes every month than Germany, Japan and Italy *combined,* and production is fast mounting to the President's goal of 60,000 airplanes, this year.

To keep that tide flowing, hundreds of great plants like those of Goodyear Aircraft are now working night and day, seven days a week, in the world's largest cooperative mass-production program.

Our part at Goodyear Aircraft is building subassemblies—wing, tail and fuselage units; cabin sections; wheels, brakes and other parts for fleets of America's fastest fighters and largest bombers.

More than that, Goodyear aircrafters have pledged the nation they will do their utmost to help beat the 60,000-airplanes-this-year schedule.

And to hit the enemy where he is deadliest, we are producing squadrons of lighter-than-air ships—the famous Goodyear blimps used by the Navy to track down U-boats.

Into this work we are concentrating all the air-skill Goodyear has acquired in more than thirty years' close association with the development of both heavier- and lighter-than-air transportation.

Into it are going all our hopes of the future in which aviation will assume its rightful place as a bond of brotherhood and commerce among all nations.

But before anything else, now we are building for victory.

Nothing less will make life, liberty and pursuit of happiness secure in this world again.

HOW GOODYEAR AIRCRAFT CORPORATION SERVES THE AIRPLANE INDUSTRY

1. *By building parts to manufacturers' specifications.*
2. *By designing parts for all types of planes.*
3. *By re-engineering parts for mass production.*
4. *By extending our research facilities to aid the solution of any design or construction problem.*

The Birdmen's Perch

WE THOUGHT WE WERE being pretty decent when we undertook to name our fluffy visitor.

It would take only a little of our time, we thought, and we'd be repaid by Oily Boid's gratitude when he

realized that he could go through life with an honest name instead of a number or a code.

We figured wrong.

The quilly quisling has bedeviled us constantly since we told him the Perch Pilots were going to name him, waking us at 5 A.M. to ask for mail. And we can't go places any more without being buttonholed while people explain why *their* name for Oily is the best name.

We're going to put an end to it next month. Good or bad, we're going to pick a name for our pheathered phobia.

Remember, the lad whose name we use gets a life-size portrait of the worm-eater.

Major Al Williams

alias, "Tattered Wing Tips," Gulf Aviation Products Manager, Gulf Bldg., Pittsburgh, Pa.

FLYING OVERCAST—1919 STYLE

Last week we saw a picture of a bomber that *was* the pride of our Army.

This lurching Liberator of 1919 looked like a well dressed warehouse. It had three wings, six motors, and eight wheels. And a speed of 85 mph!

But engineers devised new wing sections, bigger engines, and stronger undercarriages. They so improved design that much of the "ginger-bread" on the old-timer became unnecessary.

Today's bomber can fly rings around the buggy of 1919 because everything not vital to its performance has been dispensed with. Every ounce left is a working ounce.

A few years ago, Gulf men thought there was too much "gingerbread" in lubricants; too great a part of the oil was unnecessary to the job of lubrication. These research men devised a new refining procedure, the Alchlor Process, which was entirely different from old methods. This improved technique got more of the unnecessary "gingerbread"—the dangerous sludge makers and carbon formers—than had ever before been extracted from a lubricant. What remained of the oil did a better job.

Today's Gulfpride Oil does a better job of lubrication than old lubricants because everything not vital to its job of lubrication has been dispensed with. Every ounce of Gulfpride left is a working ounce.

BRAINTWISTER

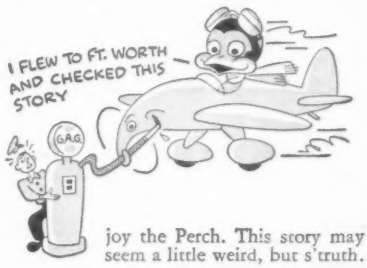
A mechanic cleaning engine parts had a 1 gal. can ¾ full of cleaning-fluid and another 1 gal. can which was empty. He wanted to measure out an exact ½ gal. of the cleaning fluid without using another can, getting more fluid, or pouring away any of the fluid he had. He did it, too. Can you?

WHOPPER

Dear Major,

We want to join your family!

We recently opened a new airport in Ft. Worth and of course, are using Gulf Aviation Gasoline. We all en-



joy the Perch. This story may seem a little weird, but s'truth.

Right after we opened up here, our first solo student decided he hated the ground. He must have, because he made 17 passes at the runway on his first landing. I was worried because my watch told me the ship was out of gas.

Then I noticed that each time he overshot the field, the intake manifold on his ship reached out to the G.A.G. pump like an ant-eater's beak. When the ground-hater finally did come in, the ship's tanks were completely full.

Is this what pilots mean when they talk about thirsty engines?

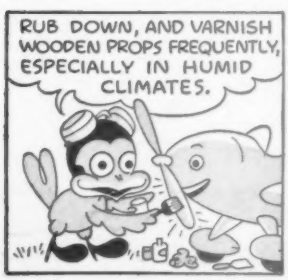
Yours very truly,

R. J. Coates, Jr.
Instructor, Mid-West Airport, Inc.
Ft. Worth, Texas

Gulf Oil Corporation and Gulf Refining Company...makers of

GULF AVIATION PRODUCTS

OIL IS AMMUNITION—USE IS WISELY!



WHEN THE "Big Boy" LANDS—

★When the world's largest bomber, the eighty-two ton B-19, returns to the ground the force of the impact is terrific. Yet this mighty leviathan of the skies lands with effortless ease because the shock is absorbed by Aerols.*

It is indeed fitting that the B-19 is equipped with Aerols. For they are overwhelmingly preferred by the aviation industry; more Aerols have been used on planes than any other kind of shock absorbing device. Furthermore, they were the *first* units to cushion landing shocks by hydraulic-pneumatic action. This principle of operation has proved so successful that is has been almost universally adopted.

Today, the engineers who pioneered and perfected Aerols are busier than ever, designing units for the warplanes of the United Nations. Tomorrow, Aerols will render an equally vital service when the skyway again becomes a great pathway of peace.

THE CLEVELAND PNEUMATIC TOOL CO.

AIRCRAFT DIVISION • **CLEVELAND, OHIO**

Also Manufacturers of **Cleco pneumatic tools for the aircraft and general industry, Cleco sheetholders, Cle-Air shock absorbers for trucks and buses, and rock drills for mining and construction work.**

AEROLS*

* THE SHOCK ABSORBING UNITS ON AN AIRPLANE'S LANDING GEAR. THE NAME IS DERIVED FROM THE WORDS "AIR" AND "OIL"—THE FLUIDS USED TO DISSIPATE THE LANDING SHOCKS

ONE INSTRUMENT THAT DOES THE WORK OF THREE

THE NEW KOLLSMAN COMBINATION DUAL TACHOMETER AND SYNCHROSCOPE

for twin-engined aircraft

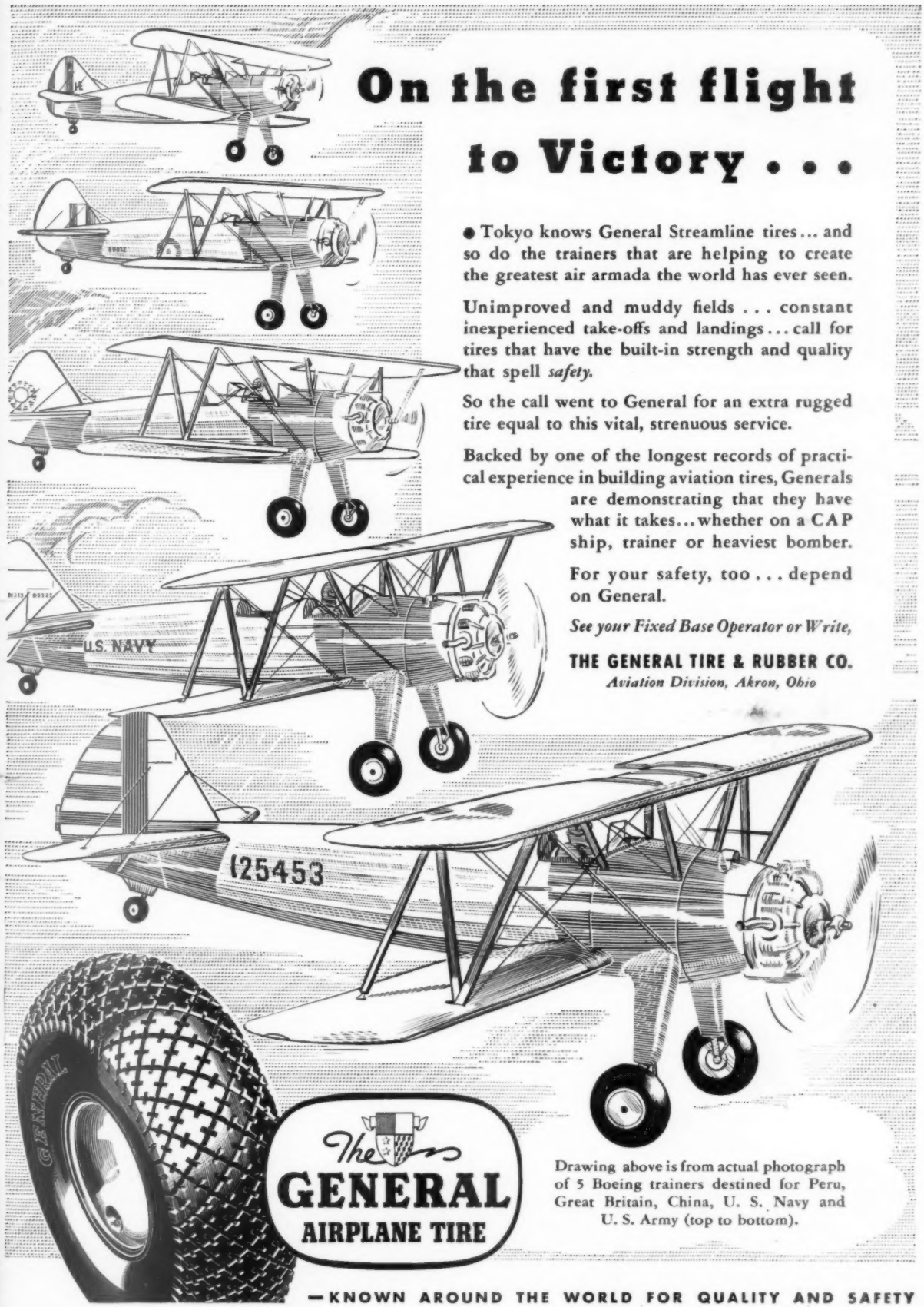
Take a look at the dial of this new Kollsman development—two tachometers and synchroscope, normally observed on three dials—now combined in a single instrument for rapid, accurate reading.

Note particularly the synchroscope sub-dial. Clockwise rotation indicates right engine too fast . . . counter-clockwise, too slow. Here is synchronization simplified to the *nth* degree.

Further than this, the new Combination Dual Tachometer and Synchroscope makes an important contribution to panel design by saving precious space and weight.

Easier to install, simple to service, parts interchangeable, ranges up to 4,500 R.P.M.; in every detail, this new instrument testifies to the intense research, engineering skill and master craftsmanship which goes into every Kollsman Instrument for aircraft of the United Nations.

KOLLSMAN
AIRCRAFT INSTRUMENTS
Product of
SQUARE D COMPANY
ELMHURST, NEW YORK • GLENDALE, CALIF.



On the first flight to Victory . . .

● Tokyo knows General Streamline tires... and so do the trainers that are helping to create the greatest air armada the world has ever seen.

Unimproved and muddy fields . . . constant inexperienced take-offs and landings... call for tires that have the built-in strength and quality that spell *safety.*

So the call went to General for an extra rugged tire equal to this vital, strenuous service.

Backed by one of the longest records of practical experience in building aviation tires, Generals are demonstrating that they have what it takes... whether on a CAP ship, trainer or heaviest bomber.

For your safety, too . . . depend on General.

See your Fixed Base Operator or Write,

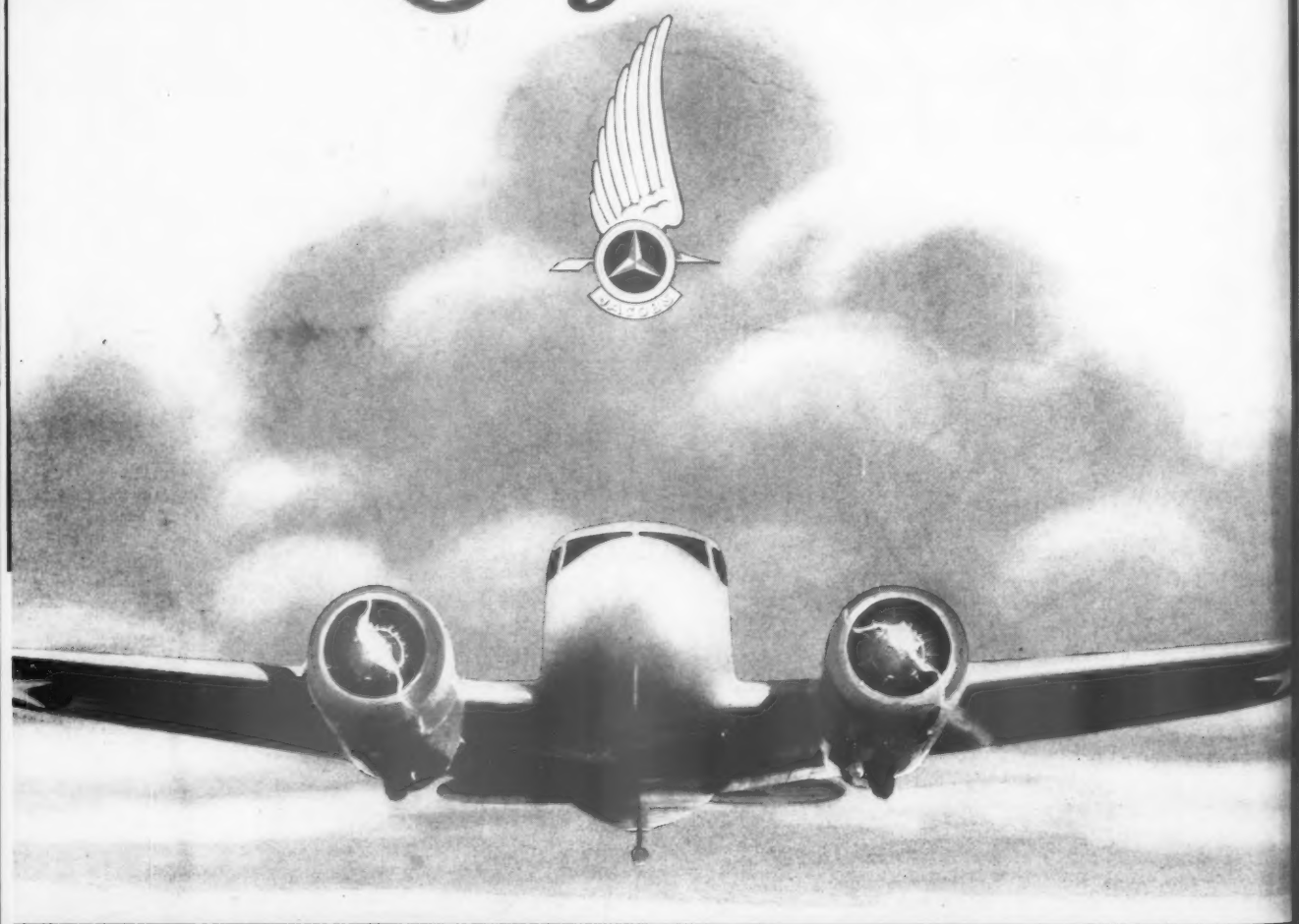
THE GENERAL TIRE & RUBBER CO.
Aviation Division, Akron, Ohio

Drawing above is from actual photograph of 5 Boeing trainers destined for Peru, Great Britain, China, U. S. Navy and U. S. Army (top to bottom).

The **GENERAL** AIRPLANE TIRE

—KNOWN AROUND THE WORLD FOR QUALITY AND SAFETY

THE MAJORITY OF TWIN ENGINE TRAINERS *are powered by* JACOBS *Engines*



THE CESSNA AT-17 "BOBCAT"

JACOBS AIRCRAFT ENGINE CO.

POTTSTOWN • PENNSYLVANIA • U·S·A·

Some day you'll commute by plane to towns and factories that are now half a day's journey away. When you do, you'll very likely forget your commutation ticket more than once.

Yes! Out of our victory in this war will come a new America. An America which will again startle the world because of the way of life our people create.

Let the "Doubting Thomas" keep this in mind: American industry is already turning out planes by the thousands that dwarf our present transports. The men and machines are already on the job. The will and determination are already at work. But today they're devoted to winning the war. *Tomorrow* they'll be devoted to the creation of this new America.

The skilled workman in the B. F. Goodrich Aeronautical Division knows how close the new America really is. He's seen the miracles of the past few years *first hand.* He's worked on tires for aircraft that can smoothly land a 30-ton Flying Fortress. He's worked on brakes that bring to a safe, smooth stop, a ship that can dive as fast as sound can travel. He's worked on De-Icers which are actually able to defy Old Man Weather himself.

The 80 aviation products B. F. Goodrich makes are serving the Army and Navy right now. Our Silvertown Tires, Expander Tube Brakes, De-Icers, Bullet Sealing Fuel Cells are helping to make America's planes the finest there are in the world!

But some day we know our handiwork at B. F. Goodrich will equip the planes of Peace. And these are the planes that will create the new America! The B. F. Goodrich Co., Aeronautical Division, Akron, O.

HERE ARE SOME FAMOUS AMERICAN FIGHTING PLANES THAT ARE SUPPLIED WITH B. F. GOODRICH EQUIPMENT

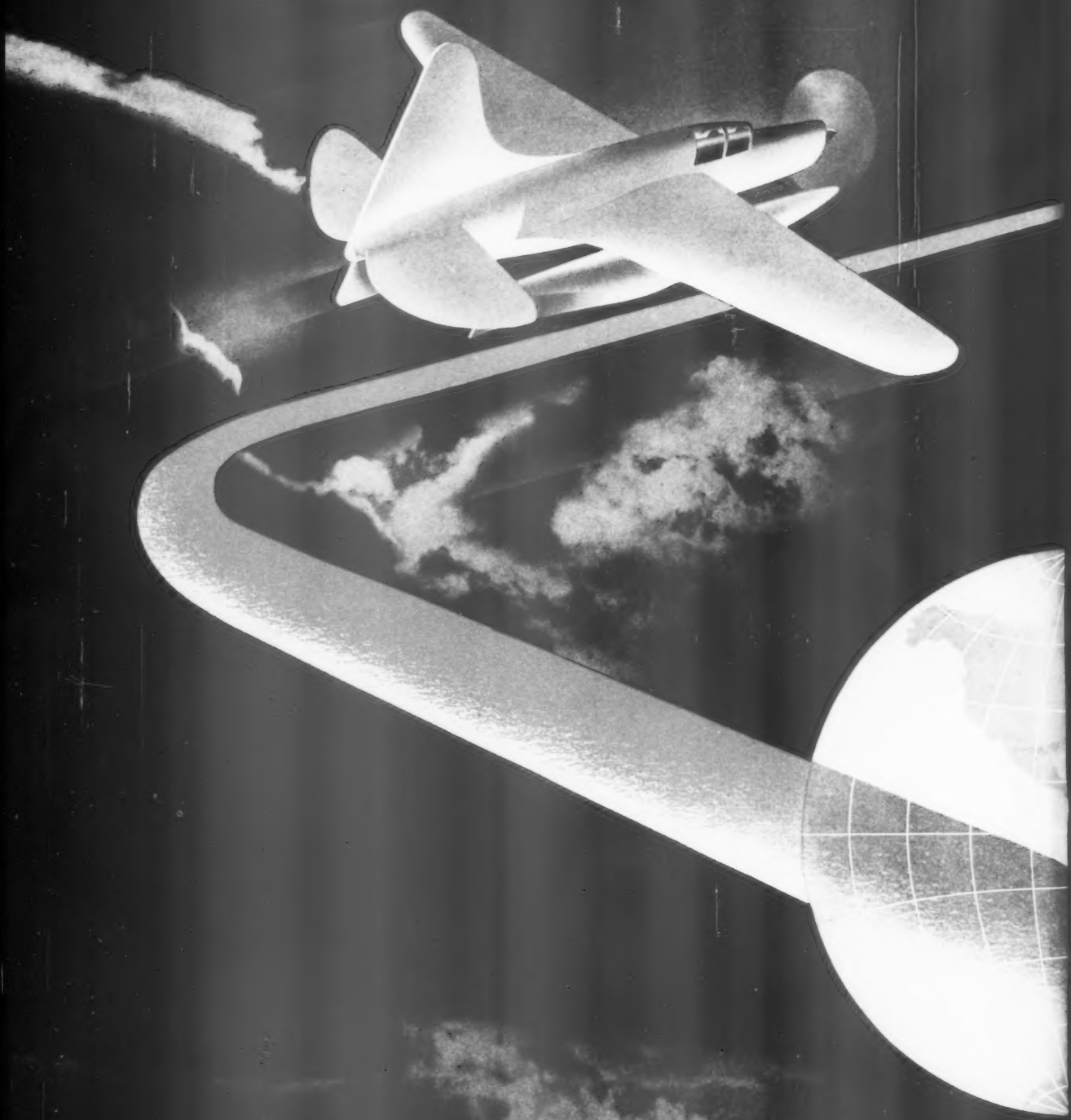
CURTISS P-40-F WARHAWK — REPUBLIC P-47 THUNDERBOLT — BELL P-39 AIRACOBRA

Skyway or Highway

B.F.Goodrich

FIRST IN RUBBER

1922 A Leader in Air Progress for Twenty Years 1942



1923—Ryan-Standard, a pioneer passenger airliner.

1923—M-1, first production monoplane in America.

1926—Brougham, widely used commercially and for numerous famous flights.

1935—S-T, low wing primary trainer; first of type adopted by the U.S. Army.

1937—S-C, cabin monoplane; private owner type.

20 Years of "Know How"

BEHIND TODAY'S total war production at Ryan are more than 7,000 yesterdays since T. Claude Ryan, founder and president of the Ryan Aeronautical Co., started an aviation business in San Diego. That was 20 years ago this month. Total assets consisted of a "Jenny" from World War I and a piano box for a tool shed. Thus did Ryan "know how" start to be acquired the hard way.

Succeeding years recorded the establishment by Ryan of the first year 'round scheduled passenger airline in the U.S.; the building of monoplanes that pioneered air mail routes and provided the basic design for many special planes (including the "Spirit of St. Louis") and scores of commercial models.

Then came volume production of Ryan trainers, sleek, maneuverable low wing monoplanes, the first of their type to be adopted by the U.S. Army, the Navy and the air forces of friendly foreign nations. Again Ryan had pioneered.

The development and manufacture of other military types followed, including the "Dragonfly" that practically hovers in mid-air. And now come Ryan-built war planes for the U.S. and United Nations Navies to seek out and strike down the enemy at sea.

These are the barest highlights of 20 busy years of "know how"... years that have seen the piano box tool shed expand ten thousand-fold into one of America's finest, most modern aircraft factories, a bulwark of our offensive against the Axis. And when this biggest of all jobs is done the Ryan Aeronautical Co. will forge out in front to as yet undreamed-of achievements with 20 years of "know how" as a mere beginning.

RYAN AERONAUTICAL COMPANY SAN DIEGO, CALIFORNIA

Member Aircraft War Production Council, Inc.

RELY ON Ryan

A NAME OF MILITARY SIGNIFICANCE

1940—YO-51 "Dragonfly" Army observation plane.

1942—YPT-25, bonded plywood primary trainer pioneers a new "wood era."

FOR the first time since war began, experienced mechanics and radio men, 18 to 45, are being hand picked for enlistment in the Army Air Forces.

These men must be experienced in the use of hand tools — must be able to go right to work maintaining and repairing airplanes, engines, instruments, machine guns, radio equipment. They must be skilled mechanics, whatever their civilian trades, so that they can quickly get the "feel" of the job. They must be capable of becoming non-commissioned officer specialists.

If you have experience or training in any of these fields *you can now enlist directly in the Air Forces.* Here you'll have a chance to work with the finest equipment, on the newest and fastest planes, preparing yourself for a career in the limitless future of aviation. You'll get the world's best training — at good pay. And you'll be in line for rapid promotion. A man who rises to Master Sergeant in his first enlistment receives $138 a month, with board, housing, uniforms, medical care free, plus additional allowances if married.

This is your opportunity to serve your country where you're needed most. Sooner or later you'll say, "It's up to me." Why not NOW?

The nearest Army Recruiting and Induction Station will gladly give you full details, without obligation.

IMPORTANT: *To avoid interference with production, every enlistment must be cleared through local Selective Service Boards. Men in technical or key positions in War Production for the Army or Navy will not be cleared.*

U. S. ARMY

"KEEP 'EM FLYING!"

RECRUITING AND INDUCTION SERVICE

• Visit or write the nearest U. S. Army Recruiting Station or write to: "The Commanding General," of the Service Command nearest you:

First Service Command.....Boston, Mass.
Second Service Command, Governors Island, N.Y.
Third Service Command.....Baltimore, Md.
Fourth Service Command.....Atlanta, Ga.
Fifth Service Command, Ft. Hayes, Columbus, O.
Sixth Service Command.....Chicago, Ill.
Seventh Service Command.....Omaha, Nebr.
Eighth Service Command, Fort Sam Houston, Tex.
Ninth Service Command.....Fort Douglas, Utah

Or write to: Enlisted Branch, Department U-1, A.G.O., Washington, D. C.

AN EDITORIAL

by

WILLIAM B. ZIFF

Editor and Publisher of FLYING Magazine,
author of "The Coming Battle of Germany"

The KAISER PLAN

THE aviation world has just seen a startling circumstance. One of the most dynamic characters in American industrial life has succeeded in taking his case past the organized agencies and to the American people themselves. Considering what Billy Mitchell failed to do in this respect, this is a phenomenon of first class importance.

This powerful personality, Henry J. Kaiser, has struck the minds of the American people with all the impact of a thunderbolt out of the blue. His influence is tremendous. The American people believe in him and have, through the proper agencies, virtually given him a mandate to go ahead.

The one gratifying feature of this whole business has been the sudden recognition all around of the primary importance of air war. Our nation has become aware that air war is no different from any other kind of war and that a task force is no better than its supply lines—hence the inevitable surging demand for cargo planes. The sound opinion of this country has demanded not only demolition and fighter planes, but adequate supply lines in the shape of winged cargo carriers.

This is the great value which emerges from the so-called "Kaiser Plan."

Its weaknesses, however, may not be glossed over.

As the matter now stands, it is useless to talk of building great flying boats in shipyards with the idea that the balance of the aeronautical industry will be unaffected.

It will be affected, and dramatically so.

There will be competition immediately for engineers, for skilled and trained men of every kind, for dies, power presses and other essential machinery. There will have to be a further "watering down" of strategic materials which are now doled out in restricted quantities to the aeronautical industry. There will presumably be a further tightening of the serious bottlenecks which now limit production. A shortage of generators alone, for example, has been known to hold up the production line as effectively as if it were in a straitjacket.

The Kaiser plan is literally a plan for absorbing a huge overflow. The fact at the moment is that this overflow does not exist. Actually American aircraft manufactories are not running more than 60 per cent of capacity. It would be much easier, moreover, to add extensions to existing plants than to tool up for entirely new operations. There is also a great deal of question in reference to flying boats themselves.

Before we build anything we ought to make up our minds why we are building it. If our view is simply to escape submarines, the flying boat is quite useful—though anyone who has watched the American Clipper held up for weeks on end because of swells not more than a few feet high, will have considerable doubts of the absolute efficiency of the flying boat as compared with its counterpart on wheels.

If what we are contemplating is a supply line able to service a great aerial task force, then we require machines which can move quickly to any single spot on the land surfaces of the world and which can land in desert or valley, or wherever landing strips can be laid.

Mr. Kaiser is one of the most valuable executives in America. He is much too valuable to be wasted on a plan whose final result is more than doubtful under the present conditions.

His plan is in danger of becoming something of a political football, an opiate for earnest Americans who believe that thereby we are attaining aerial supremacy and emancipating our supply conduits from enemy interference. In this sense it is a piece of dangerous legerdemain.

Mr. Kaiser's plan is valueless unless an all-out air war is prepared for. This bold and admirable scheme becomes not only inadequate but ridiculous when it is based on the premise that Mr. Kaiser must find his own materials, his own technicians, his own electric power and his own dies and machines in a nation at war, and where the Government holds and maintains a monopoly on all of these.

There is only one proper way in which all this can be handled. We should stop this whole ridiculous system of allocation and give the aircraft industry the green light, granting it complete and absolute priority on materials of all kinds as well as on machines, men and industrial power—or we should make Mr. Kaiser useful in some other direction.

If we decide to give aviation the green light, a man of Mr. Kaiser's power and force could very well be acceptable as the czar of the aviation industry during the entire period of the emergency. There would then be no further allocation of critical materials to surface ships, tanks or any other instruments of war until the needs of the aircraft manufacturing program had been completely met—in short, until the saturation point had been reached on all construction which related to the immediate plan of all-out air attack.

Present discussions have almost obscured the fact that we are now turning out a rather decent complement of cargo planes which are now crossing all the oceans of the world and operating on all five continents This output can be quickly increased if Government officials will place the orders and allow for the required stream of critical materials. And it should be increased.

The question is a far greater one than that of turning shipyards over to the building of airplanes If this entire new plan is in the wrong direction, if it involves a further accentuation of bottlenecks, and a watering-out of engineers, critical materials, basic machines and power, it will be a distinct disservice to our war effort. If, through the energy, skill and dynamism by which Mr. Kaiser's proposal has been advanced, we can force back the political and military diehards who insist on looking at this war in terms of World War I, he will have performed the greatest public service since Billy Mitchell.

WAR IN THE AIR

On all fronts, over land and sea, the air continues to hold the center of the stage. Outstanding incidents of Allied and enemy air activities are shown in this section.

U. S. mechanics service a Bell P-39 "Airacobra" at an improvised airport near Port Moresby, New Guinea.

Captured when his "Zero" crashed in Australia, Jap pilot heads for prison camp.

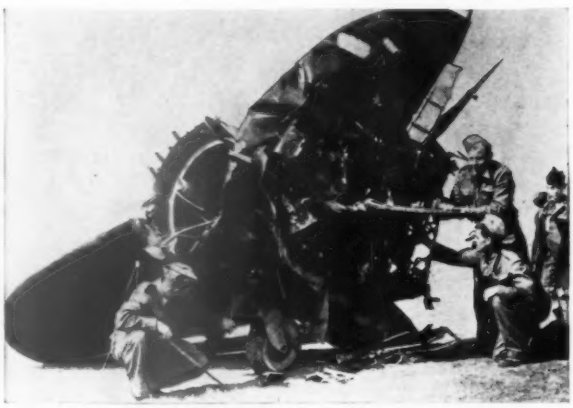
Senussi tribesmen find that RAF .50 caliber machine gun bullets make a fancy headgear.

Lockheed "Lightnings" on Australian dock. Note belly tanks flanking P-38's fuselage.

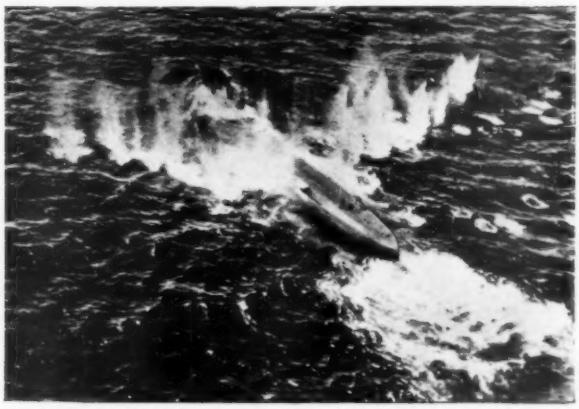
Maj. Gen. Carl Spaatz, chief of the AAF in Europe, pinning the DSC on Maj. Charles C. Kegelman for his part in bombing Nazi airports July 4.

Junkers Ju-87 downed in Libyan battle is destroyed by the RAF to prevent possible salvaging by Nazis.

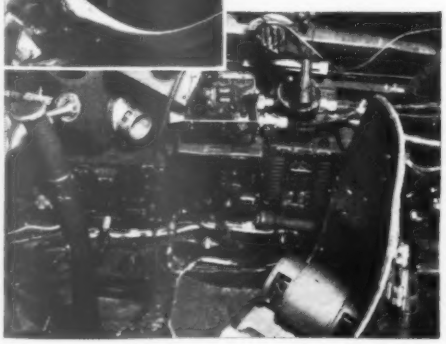
Hundreds of RAF airmen downed at sea have been rescued by close co-operation of air and surface craft. Here a pilot is being hauled aboard a "Walrus" amphibian. Note "Lysander" circling scene.



This tail of a Heinkel He-111K came down in one piece as plane exploded when hit during attempt to bomb England.

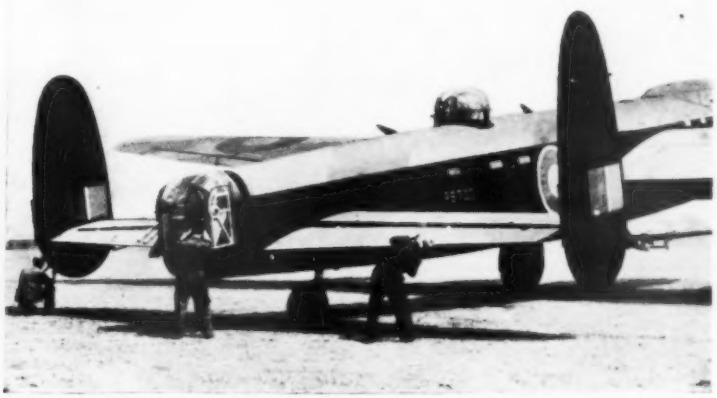


An RAF "Sunderland" spotted this U-boat in Bay of Biscay. Bombing and gunning split submarine's plates and sank it.



Engine and propeller of crashed Jap "Zero" (left), and (below) its cockpit. Made in U.S.A. radio compass, bearing American maker's name, was among instruments.

In the forefront of the RAF's bombing operations against German war industrial centers is the Avro "Lancaster." It is powered with four Rolls-Royce "Merlins."



WAR IN THE AIR *(CONTINUED)*

Douglas "Bostons" of the South African Air Force. Army Air Forces and the RAF also are operating in Egyptian campaign.

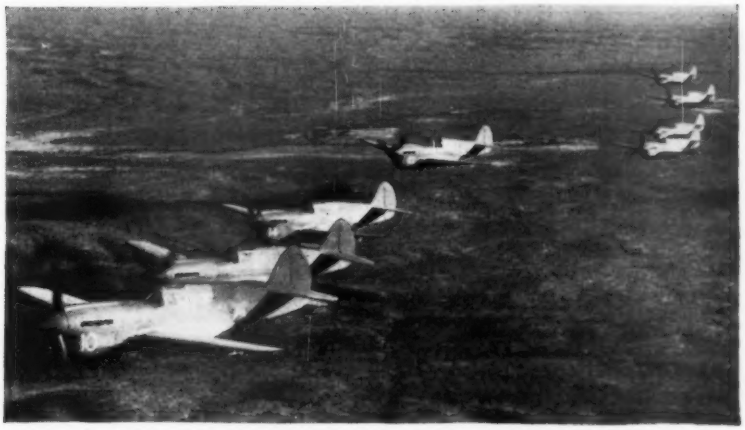
This crew of an Italian bomber downed in the Mediterranean landed in Egypt. They cheerfully headed for a prison camp.

Autographing Italian plane insignia for the officer of a British service men's center (similar to USO) at Tobruk.

When bomb was released from 15-foot altitude, it bounced back from ground, doing this damage to Martin "Maryland."

Riddled by Jap bullets, this Douglas SBD-3 returned to its carrier in Pacific. Note holes in "15" beside the cockpit.

Attack on British Malta convoy was fatal for 43 enemy planes. Sequence shows how a Savoia Marchetti SM-79 bomber came in a low level attack, banked sharply when it encountered heavy fire, attempted to flee from crack gunners but was hit squarely, sending it plummeting headlong into sea.

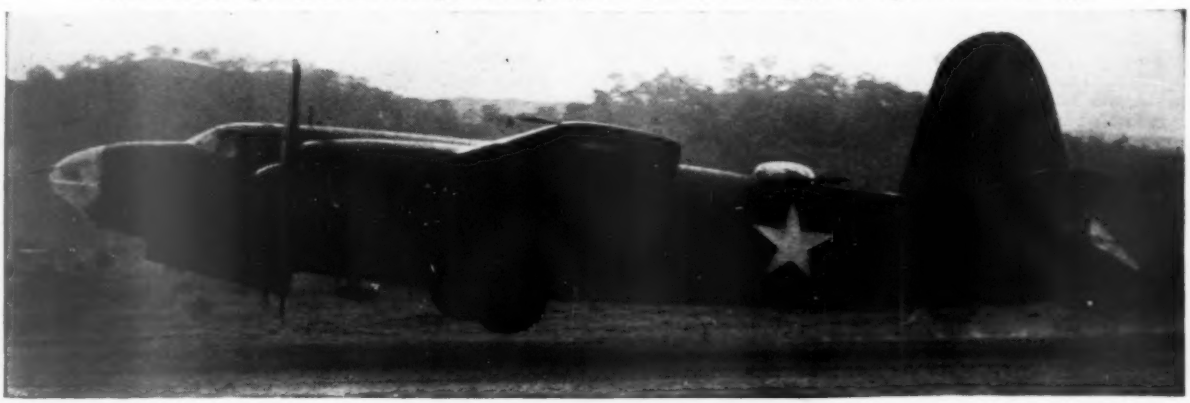


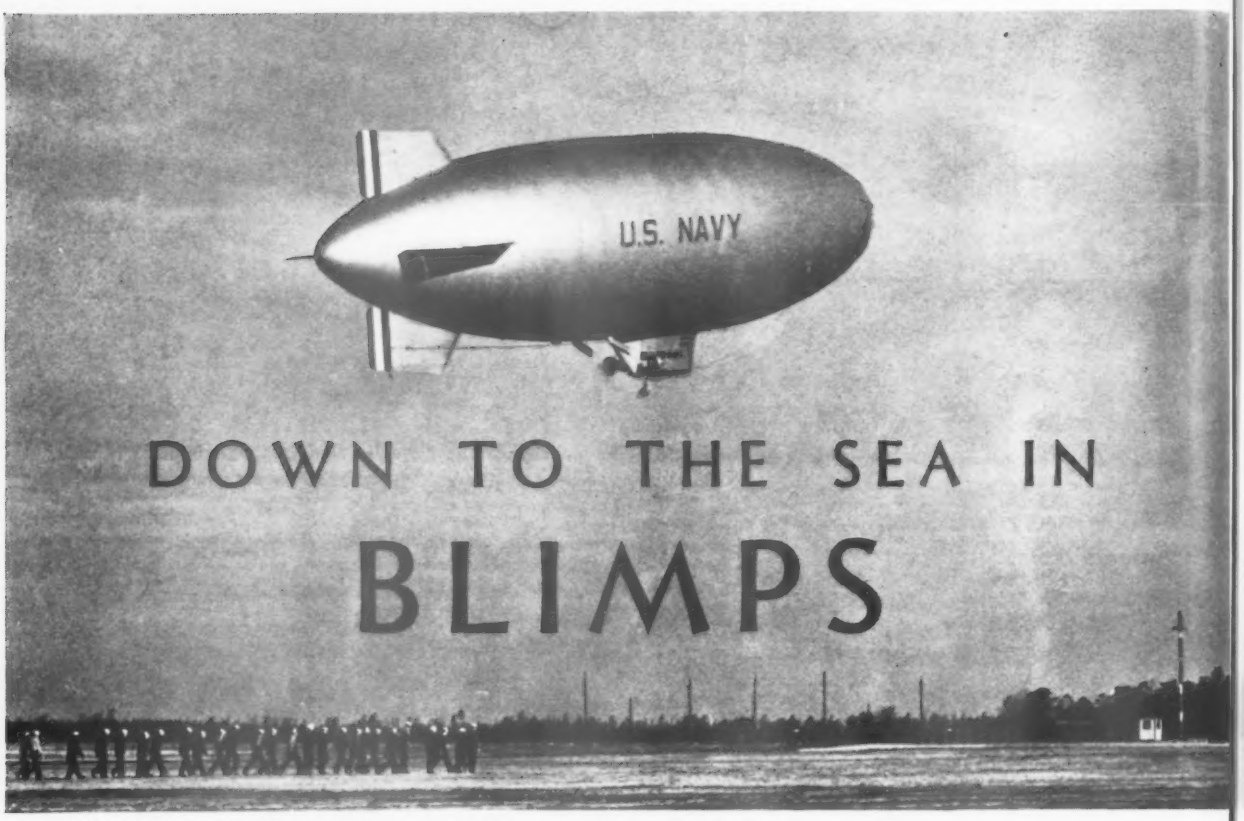
Six .50 caliber machine guns in the wings of these Curtiss P-40E "Kittyhawks," based in Australia and flown by AAF pilots, have proven effective against Japs.

The RAF has wreaked havoc among Nazi mechanized equipment by using the "Kittyhawk" in desert warfare first as a dive bomber and then in its proper role as a fighter.

This North American B-25 will be flown to Russia by Soviet airman (left) after he learns operation. Instructor is a U. S. Army pilot, airport is in Middle East.

Martin B-26 coming in for a crash landing at Port Moresby, New Guinea, its landing gear damaged in combat with Japs.





DOWN TO THE SEA IN BLIMPS

This is an L-type trainer taking off at Lakehurst. Ocean patrol blimps are K-type.

by Ens. EARL E. BURTON

Bureau of Aeronautics, Navy Department

The Navy is training an unusual type of flying man for an unusual flying job—the sub-hunting blimp patrol. This is the story of the man's training.

BLIMPS and rigids in the sky above the sandy, windswept flats of Lakehurst, N. J., have been a common sight since the early 1920's.

To the people who live along the shore resorts—Asbury Park, Atlantic City, and down through Cape May—the steady, powerful drone of motors overhead formerly meant another Atlantic crossing for the *Graf Zeppelin* or the *Hindenburg*.

Today, along the darkened coast is another familiar drone of motors—the Navy blimp patrol. These non-rigid helium-filled patrol ships have assumed a major importance in submarine warfare. With a cruising range of around 1,500 miles, armed with depth bombs and machine guns, they are a formidable opponent for any U-boat commander to face.

With this in mind, the Navy has launched the most intensive lighter-than-air training program in its history. From dawn until dusk, the air over Lakehurst's scrub pine country is filled with training blimps landing and taking off, training pilots for operational bases on the east and west coasts.

The first class of aviation cadets for lighter-than-air training since the World War I reported to Lakehurst Naval Air Station on October 28, 1940. The class was small, composed largely of men already conversant with lighter-than-air operating by their civilian occupations.

As the war in Europe grew more intense and threatened to spread to the western hemisphere, plans for an expanded lighter-than-air program began to take shape. Congress authorized the construction of 48 non-rigid patrol ships. Volunteer candidates for training were accepted from pools of boys who had enrolled for heavier-than-air training. (Qualifications are the same in both cases.) The age limits have been lowered to 18 and educational requirements now demand only a high school education. When prospective pilots are selected by the Selection Board they are enrolled as seamen second class, V-5, USNR. The selection of candidates for lighter-than-air training originates with the personal request of the cadet while he is undergoing his three months pre-flight training for toughening-up. If accepted under the quota set up for lighter-than-air he is, upon completion of this pre-flight training, ordered to the Naval Air Station, Lakehurst, N. J., for LTA training.

His first impression of the station is one of intense activity. Out on the wide, level plateau-like flying field are landing crews, grouped and waiting to "snub" a training ship that is slowly poking its nose down toward a mooring mast. A group of cadets is standing by to change places with the crew in the landing ship. Nearby, a squad is doing military drill.

The new student will soon become an active participant in all this when he starts in the preliminary ground school.

His first day at Lakehurst begins at 8 o'clock in the morning when he reports to the central office with his orders. Here, he receives a copy of station regulations and any mail that may be waiting for him.

He is then introduced to the commanding officer. The next step is to sign in at the pay office. After his flight examination by the medical officer, he is given an identification card. Arrangements must be made to procure uniforms and he is assigned to a bunk in one of the barracks. This is to be his new home until gradua-

Sub-spotters at work. The Navy soon will have 48 of these ocean-going blimps.

tion. It's new, clean and airy. He meets his bunk mates, boys from every part of the country. He'll get to know them well as they go through ground school, fly the 250 hours required to earn the gold wings of a Naval aviator (airship).

Ground school really begins in earnest the second day. The morning is occupied by lectures in cadet organization and regulations, organization of ground and flight training. Training memoranda and reading lists are passed out. The purpose and mission of patrol ships are outlined.

This primary ground school usually lasts a week or 10 days. It includes a complete tour of the station to familiarize the student with his surroundings. The boys inspect the non-rigid ships, watch the ground crews handling them and take notes on all they see.

Their lecture curriculum covers aerology, aviation medicine, Naval customs and traditions, seamanship, and Naval command and procedure. Supplementing study and lectures are physical exercise and military drill.

Sometime during this 10-day period, the students are sworn in as aviation cadets. They exchange their seaman-second class uniforms for the cadet khaki.

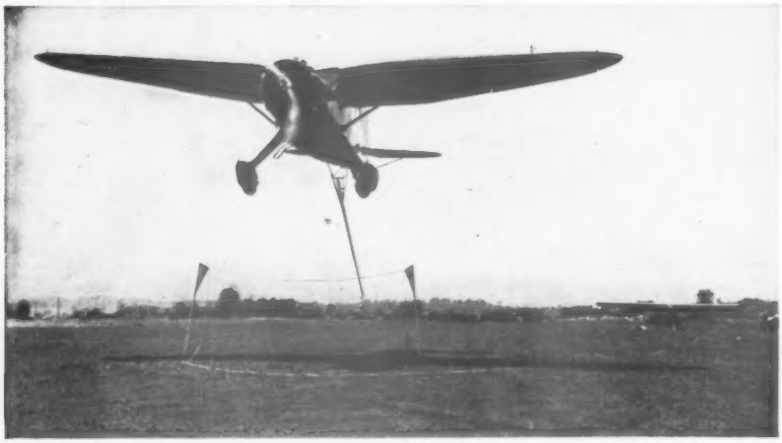
Following the first term of primary ground school, the cadet enters the actual flight training phase. This second term of primary training is conducted on a system of alternating flight days and ground school days.

(*Continued on page 97*)

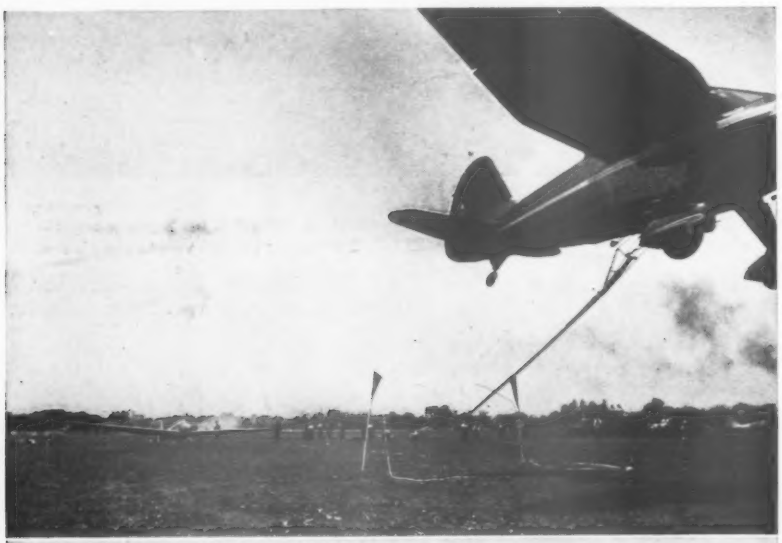
All the comforts of home. A crew member of a K-ship whips up bacon and eggs at sea. Blimps can remain out 50 hours.

A blimp's radio operator at work as his ship flies along the east coast. Note one of the ship's engines outside the window.

Air Pick-up Goes To War



One of All American Aviation's specially equipped Stinsons hooks the towline at 100 m.p.h. In this Wright Field test, a Piper "Cub," minus propeller, served as glider.



In the two pictures above an Army XTG-3 training glider is taken in tow. Upper photo shows the towline leaving the posts. Note special "Cub" at right in lower picture.

by

Rep. JENNINGS RANDOLPH

Congressman from West Virginia

WHEN a plane swooped down at the Army's Wright Field in Ohio, and took a grounded glider in tow, the most keenly interested but least surprised at the success of the spectacular test were the airmen who with bags of mail had done that sort of job thousands of times as a matter of daily routine.

The Army Air Forces' new non-stop glider pick-up system for air-war operations stems directly from the air pick-up service which is now in its fourth year of demonstrated usefulness.

The Stinson monoplane employed in the Wright Field glider experiment which the War Department reported in June was the same type craft used to pick up mail bags in towns in West Virginia, Pennsylvania and nearby states. The method of launching the glider was basically the same. Similar equipment was used also in a pioneer test made as long ago as last October by Lew Barringer, now a major and director of the fast expanding AAF glider training program, and other Army airmen.

Thus one of the most important developments in the history of commercial air transportation is making its direct contribution to the nation's armed forces. Inaugurated May 12, 1939, the air pick-up service recently had its third anniversary. Congress was somewhat dubious in authorizing the service to determine the practicability of extending the benefits of air transport to communities off the beaten tracks of the regular airlines, through this ingenious system by which mail and cargo are collected and delivered by airplanes in flight. But the remarkable record that has been made in the three years completely vindicates the judgment of members of Congress who supported the legislation which brought about its establishment.

This particular member of the House of Representatives is especially interested because experimental work in developing the unique service was carried out in his state and, like our rural free delivery system for ordinary mail of which the air pick-up service is the modern prototype, the program was inaugurated over a route which lay for the most part in West Virginia. I recall the obstacles which confronted Dr. L. S. Adams, inventor, when he worked out of headquarters at Morgantown, where he had come at my request. Those were pioneering days which are often recalled when we chat together.

At the outset the air pick-up service

Air mail, express—and gliders—come under the heading of business-as-usual for All American Aviation. Recent tests by Army experts at Wright Field proved that this novel airline's regular pick-up equipment could help the U. S. war effort.

was operated over two experimental routes, covering 945 miles. One extended between Pittsburgh and Philadelphia via 28 intermediate points, and the other between Pittsburgh and Huntington, W. Va., via the same number of intermediate points in southwestern Pennsylvania, West Virginia and southeastern Ohio.

This region was selected by the Post Office Department for the test because of the early experimental work done there, and because the difficult flying conditions of weather and terrain encountered in the area afforded an opportunity to test the new system under the most exacting circumstances.

After a year's test, the postmaster general, in reporting to Congress, as required by law, stated that the record of the service for a new type of operation was "perhaps without precedent when all conditions are considered."

The air pick-up service subsequently was placed on a permanent basis by the Civil Aeronautics Board by granting All American Aviation, Inc., headed by Richard C. du Pont, noted glider pilot, the company which had successfully operated the experimental routes, a certificate of public convenience and necessity for five lines. These radiate from Pittsburgh to Philadelphia and Williamsport, Pa., Jamestown, N. Y., and Huntington, W. Va., linking 112 communities in West Virginia, Pennsylvania, New York, Delaware, Ohio and Kentucky. They serve 65 communities in Pennsylvania, 33 in West Virginia, nine in Ohio, two each in Delaware and Kentucky, and one in New York state.

This number of towns is about half those served by all the trunk air lines. Through the system Pennsylvania and West Virginia have been provided with the most comprehensive air transportation facilities of any states. Service is provided on two daily schedules over routes that cover 1,386 miles.

In the three years, the pick-up planes have completed approximately 94 per cent of their schedules, and have had no serious damage to either equipment or cargo. In that time they have flown 1,712,105 revenue miles, made 93,934 pick-ups and deliveries, transported 375,762 pounds of air mail, and 49,921 pounds of air express.

A peak was reached in the traffic over the five routes in April when the mail transported totalled 23,785 pounds and air express 8,432 pounds. This represented an increase of 62 per cent over the same month in 1941.

The air mail dispatched in the past year has almost tripled in the 33 communities in West Virginia which are on air pick-up routes. In April of this year these communities dispatched a total of 116,675 pieces of mail, compared with 39,404 in April, 1941, a net increase of 196 per cent. And the gain in the air mail traffic in the other communities served likewise has been little short of phenomenal.

When the legislation authorizing establishment of the system was under discussion in committee hearings and on the House floor, the question was raised as to whether the service could generate sufficient postal revenues to justify its operation. The point was made that the cost of operation might be prohibitive. But the volume of traffic that is moving over the pick-up lines today has completely removed concern on that score.

From the standpoint of cost to the government, these lines have now reached the point of breaking even if indeed they are not showing an actual profit to the Post Office Department. No other airline in the country has reached this point in so short a period.

Recently the president of one of the largest airlines was quoted as saying that in his opinion it would probably always be necessary for the Government to subsidize the operation of the air pick-up service the same as it does the rural free delivery service because it would never be able to support itself from air mail revenues alone. The results of the present service completely refute this idea.

Incidentally, on the question of subsidy, the Post Office payments made to carriers for transporting the air mail represent only a fraction of the financial assistance they are receiving from the Government in air navigational aids and airport facilities and other elaborate facilities that have been established by the Government in encouraging the development of civil aviation.

The air pick-up service, being strictly a contract operation, could function with-

One of the first troop-carrying gliders completed and flown is this Waco model. It carries two pilots and a number of equipped soldiers. Note the enclosed cabin, headlight, conventional landing gear and skids.

out any of these expensive facilities which are maintained at federal expense for the operation of the trunk lines. If we had a nationwide system of air pick-up lines, the results of the operations by All American Aviation indicate that they would become self-sustaining within a relatively short time.

Excluding the terminal points of Pittsburgh and Philadelphia, the population of the communities being served by the existing system varies between the 588 residents of Glenville, W. Va., to 112,504, which is the population of Wilmington, Del.

The tremendous increase in air mail patronage that has taken place in these communities is visible proof that our people fully appreciate the advantages of air transportation. They will support it when they are given direct service, assuring them that their mail and urgent cargo moves by air all the way and is not subject to surface haul which so often destroys much of the value of air transportation.

This gap between the trunk line cities and the off-lying towns to and from which air mail and air express must move on the ground is one of the great weaknesses of our air transport system. To the communities on the pick-up routes the gap has largely been bridged.

Aside from the direct contribution to the war effort made by the adaptation of the pick-up procedure to gliders, present pick-up lines serve an area in which many of our large war industries are situated. By giving these industries overnight air service to practically every point in the country, and by delivering to them mail and cargo on the same day it arrives at the trunk line terminals, the air pick-up service is definitely helping the war effort under conditions where speed in transportation and communication is often a matter of desperate urgency.

Almost inevitably when the war is over there will be a vast expansion of air transportation facilities throughout the United States and the world. Almost as unquestionably the air pick-up system will have an important part in this expansion. No airports are required for its operation, so that air service is brought within the reach of the smallest hamlet.

Just now there are pending before the Civil Aeronautics Board applications to establish similar pick-up routes in more than 26 additional states which would serve over 1,400 communities now without air service, and add about 25,000 route miles to the existing airline system. These plans forecast the expansion that is coming in this type of service.

It is to be regretted that this service has not been extended more rapidly. There are many other areas in the country in which the air pick-up system, were it now operating, could be of very great assistance to the war effort as it is in the section where it now exists.

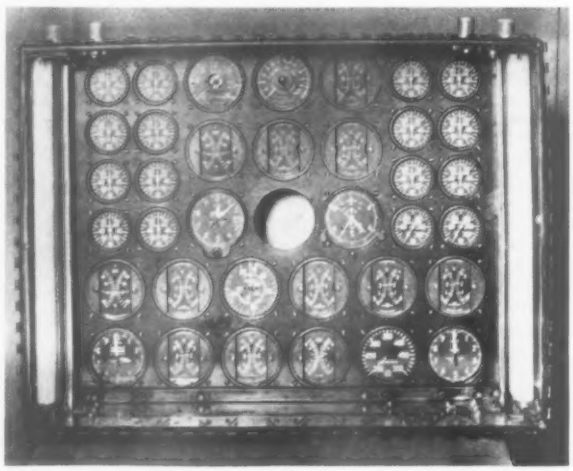
The mechanics of the commercial air pick-up service have been applied to the problem of launching military gliders in a particularly ingenious manner. The glider used in the Wright Field demonstration was an XTG-3 and the pick-ups

(*Continued on page* 112)

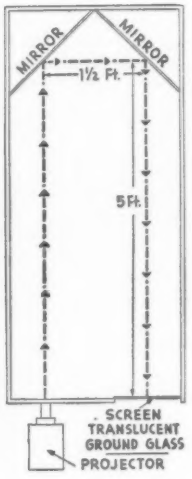
It's Done With Mirrors

by LEWIS TANSKY

Accurate, simultaneous recording of instruments during flight test is achieved by camera device.



Camera lens projects through center of special instrument panel. Mirror facing lighted board reflects all movements.



How mirrors aid in projection of film.

IMAGINE a motion picture studio, traveling several miles a minute far above the clouds, with 60 flickering needles and gauges as the cast of characters, and you have some idea of the photo recorder, the Republic Aviation Corporation camera development which speeds flight test gathering data to a degree unthought of as recently as two years ago.

It is as though the flight actually were brought to the engineer. Fifteen minutes after a plane lands an aerodynamicist can sit in a darkened room and project on a screen a film showing instrument panel readings at various stages of flight. Information that took months of flying to obtain, now can be gathered in a week. Accomplishing the work quickly is one advantage, but as great a one is that all these readings are obtained simultaneously, thus giving engineers a clear picture of how the craft is performing under each single condition. Even if it were humanly possible to record these readings by hand instead of photo, time and space necessarily would elapse before all the readings were noted. Thus the conditions would be altered.

One of the lads in the hangar put it in another way when he said, "Bud, when you're bouncing along at more than 300, you ain't got time for literature, and you ain't standing still."

It all began slightly more than two years ago. Republic engineers wheeled out the XP-43 *(Lancer)*. "Here she is; let's have the dope," they told George Burrell, chief test pilot at Republic until his recent death in an airplane accident.

Burrell, as anxious as anyone to get the data and to put the ship in production, told them that it would be impossible to get complete information rapidly under the system then used. "But I think I've got a new way," he told them.

With that he began the long and often disheartening technical task of adapting available photographic equipment to the exacting demands of flight test. His first strip was run off at his home in Huntington, L. I.

"Two or three instruments in the middle of the board were readable, but the others were blurred," Mrs. Burrell recalled recently. "After seeing them I never dreamed that anything satisfactory could be accomplished."

Burrell's contribution and that of his

(*Continued on page* 93)

Entire device is enclosed in aluminum case.

This British soldier in the Middle East got one of the first airgraphs from London.

Producing 360 copies off a 50 ft. roll of 16 mm. film, this continuous enlarger turns out 60 copies a minute. Instead of 30 lbs., 1,500 letters are reduced to 6½ ounces.

AIR MAIL EVERYWHERE

by FRANCIS D. BRADBROOKE

Editorial Staff, The Aeroplane, London

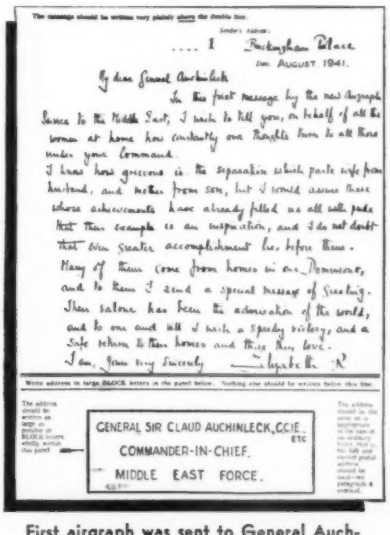
A ton of mail can be compressed into a 17-pound package and flown cheaply anywhere in the world, thanks to this ingenious photographic equipment.

ON May 13, 1941, the first 50,000 airgraph letters from the Middle East arrived in London. They had taken two weeks in transit and weighed only 13 lbs., instead of the 1,500 lbs. which a similar number of ordinary letters would have weighed. The time saved was some nine or 10 weeks.

In less than a year about 19,000,000 airgraph letters have been flown to and from Great Britain and the Middle East, India and East Africa. This strikingly demonstrates the tremendous saving in weight and the advantages of the airgraph method whereby letters are photographed to a minute size on microfilm, the film is flown to its destination and, on arrival, is enlarged again at a cost to the sender of about five cents. By this system 1,500 letters weigh only 6½ oz. instead of 30 lbs., take up only a few inches of space, and quick communications overseas are assured.

Because of this tremendous saving in weight and space, letters to and from soldiers, sailors and airmen serving overseas have been received within two or three weeks, instead of the two or three months usually taken by letters sent by surface routes or by a combination of air and surface routes. Though the airgraph system was not put to wide use until last year, when it became the first service of its kind in the world, a similar idea was thought of some 15 years ago, and the idea of photographing and reducing letters was first tried out with pigeon posts during the Franco-Prussian War of 1870–1871.

At that time letters intended for Paris were printed on large sheets at Tours, some 200 letters to each sheet, and these were reduced to about the size of a postage stamp. Eighteen sheets were then rolled into a quill and the quill was sewn under the wing of a pigeon. Those messages were restricted to private affairs and were limited to 20 words at a cost of eight cents per word.



....1 Buckingham Palace
1st AUGUST 1941.

My dear General Auchinleck

In the first message by the new Airgraph Service to the Middle East, I wish to tell you, on behalf of all the women at home how constantly our thoughts turn to all those under your Command.

I know how generous is the appreciation which parts wife from husband, and mother from son, but I would assure those whose achievements have already filled us all with pride that their example is an inspiration, and I do not doubt that even greater accomplishment lies before them.

Many of them come from homes in the Dominions, and to them I send a special message of greeting. Their nations have been the adversaries of the world, and to one and all I wish a speedy victory, and a safe return to their homes and those they love.

I am, Yours very sincerely
Elizabeth R.

Write address in large BLOCK letters in the panel below. Nothing else should be written below this line.

GENERAL SIR CLAUD AUCHINLECK, G.C.I.E. ETC
COMMANDER-IN-CHIEF.
MIDDLE EAST FORCE.

First airgraph was sent to General Auchinleck, Middle East commander, by Queen Elizabeth on August 15, 1941. Service now is operated between England and Aden, Iraq, East Africa, Canada and soon to U.S.

It was more than half a century later that the present airgraph system was evolved by Airgraphs Ltd. of Delaware, a company formed by Pan American Airways, Inc., the Eastman Kodak Company, and Imperial Airways, Ltd. (now the British Overseas Airways Corporation), for the economical delivery of air mails across the Atlantic. But the idea was not adopted and few people in Britain knew anything about it until the need for faster mails for the forces serving overseas became necessary.

Since the beginning of the war Great Britain's overseas air transport organization, the British Overseas Airways Corporation, known as British Airways for short, has been operating solely for the government. The corporation retains its civil status because only civil airplanes may operate to neutral countries, but all its services are directed towards helping the war effort.

(*Continued on page 98*)

Cologne Raid

This is one of the gutted sections in the center of Cologne. Note how certain areas are levelled while others appear intact.

by Sq. Ldr. J. DeL. Wooldridge, D.S.M.

An RAF pilot who flew one of the thousand bombers tells his story of that now historic mass aerial raid.

THERE was a gasp and then a momentary silence after the C.O. had spoken. We looked at each other in amazement, unable at first to digest what he had said. "There are over 1,000 aircraft bombing this target tonight." He went on quickly to give further details. "The moon is full . . . we are attempting to saturate the defenses . . . a very considerable number of intruder aircraft are operating against enemy fighters . . . a large force will fire the target . . . you are carrying heavy bombs . . . blast the wreckage about . . . strict discipline over the target to avoid collision."

I thought back suddenly to my first trip over the Ruhr two years ago—25 aircraft to fly over the area after bombing their objective in order to enforce the blackout. . . .

Steve, my navigator, was calculating, his eyes alight with anticipation. "One thousand aircraft . . . hundreds and hundreds of tons of bombs . . . 6,000 men . . . over a million gallons of petrol . . . all droning round the sky over one little spot in Germany. . . . "Oh, boy! Someone in the night shift is going to get a sore head tonight!"

On the tarmac before our take-off we looked up into the gathering gloom overhead. From every quarter came the sinister rumble of heavily laden aircraft heading southeast. From the aerodrome next door we could hear the high-powered drone of machine after machine taking off. It was a good night—clear and dark as yet. The moon would be up later. I collected my crew together and we drove out in the lorry to our aircraft—an Avro *Lancaster*, very new and clean, with only a couple of raids to her credit. Tonight we should see sights in her such as no other bomber crews had ever seen before. The corporal came forward from the shadow of the wing and saluted.

"She's all ready, sir."

"Okay," I said. "Start her up."

From across the aerodrome came a crackle as one of the motors from another aircraft kicked into life. Then, one by one, we took off.

Twenty minutes later we were climbing over the Wash. The moon was coming up off the port wing tip—very strong and fiery. A few wraiths of cloud drifted across its face; otherwise the starlit sky was as clear as sparkling crystal. A thousand feet away in the half light around us we could discern the lumbering shape of a Short *Stirling*. Ahead, and far below, was the curved outline of the Hook of Holland. The North Sea was smooth and black as ebony, except for the broad path of the moon's light. We flew on. Many miles ahead, spread thinly over the horizon, was a layer of smooth cloud. Somewhere beneath that lay Cologne. Already the guns were beginning to open up on our first aircraft. Stabbing flashes glared across the face of the cloud. Twinkling shell bursts spattered the sky. We watched intently as the four powerful motors drove us on across Holland.

Then we saw what we were waiting for. In a great gleaming path a stick of incendiaries burst. We were still a long way off, but their brilliance was reflected in the cloud thousands of feet above. Gradually the silver glow turned to red as buildings began to burn. Down went another stick, and another and then another. Within a few minutes the whole area of the city was smothered in rolling white hot eruptions.

We came closer. About us the searchlights stabbed the sky, weaving and seeking out the aircraft around us. The propellers flashed silver—the darkness was torn by blazing lights on every side. A great dull red splash poured upwards from the center of the town. By now a tall column of smoke stood vertically up towards the stars. The River Rhine below reflected every detail of the grotesque nightmare.

We prepared to drop our bombs. Steve was down in the nose, directing me on

(*Continued on page* 112)

One of these "Liberators" soon will be produced every hour by just one factory.

PRODUCTION— OUR HOME FRONT

One of the most colorful and one of the shrewdest aeronautical engineers in the business, Bill Stout is famed for his record of designing and building aircraft years in advance of the "normal trend." Designer of the tri-motored Ford and the Stout "Skycar," he now is completing a stainless steel design for the private owner which incorporates a revolutionary engine, also of his design. Born in Illinois 62 years ago, Stout now has his own engineering laboratory in Dearborn, Mich., where he produces prototypes of his ideas.—Ed.

by WILLIAM B. STOUT

So the Germans are supermen when it comes to mass production? One of America's outstanding engineers thinks the Nazis actually are slow.

WHILE the Axis powers have undoubtedly shown a great ability in design and the building of planes and machinery, America is the only country in the world which understands production.

The German Junkers plant, at its full capacity, today is reported to be turning out 12 to 15 planes daily.

In the automobile business that would almost be a tool shop job. Fifteen an hour is even "small potatoes" from the figuring of Detroit production men in the automobile field. Not tens a day but thousands a day is their line of thought and tooling is made for that kind of work. Also, if you make 15 a day of something, you have not production enough to make good tools or to achieve good metallurgy or to get experience enough to get the proper service in the field.

Our late idea of war was manpower, and the country with the biggest army had the greatest chance to win. That is no longer true—war is now mechanical and the land with the greatest number of machines, coupled with the highest education and technical superiority of the men who operate these machines, wins the war.

In the building of planes, Germany and the Allies still work on the basis of man-hours and the use of every available individual for work—in their homes or home workshops, in their cellars and wherever possible—to make pieces and more pieces so that a combined *man*power program may develop a flow of machinery and production.

America thinks in terms of *machine*-hours, of trained men operating armies of machine tools which not only turn out a thousand pieces to one which can be done by hand, but which pieces may be accurate to a fraction of a thousandth of an inch—whereas the hand job always has the human element.

Germany took seven years to build up a production system for war. If the surplus of the machinery which she installed had been used to better the living conditions of the German people there would have been no cause for war. Instead of this, money was taken away from the

people and built into a war machine to take things away from other nations on the old Prussian idea of conquest and rule by force.

England, in advancing her war program, followed more the German system than any other. The chief fault of the British system is that it must be right because it is British—and for no other reason. This has not proved accurate in this technical age.

Britain's approach toward their mechanical problems has been extremely complicated and expensive. Their engine designs have been laid down with no basic knowledge or care for the essentials of production and their Rolls-Royce engine, for example, liquid-cooled, is built with files and emery cloth, hand fitted in a "fittings shop" and with "more stud bolts than rivets in a *Stratoliner*."

The Germans, on the other hand, have taken steps to simplify. They have arranged mechanisms to cut man-hours and increase accuracy. They are not concerned whether something is a German idea or any other—if it is good.

Boss Kettering tells a story of being at a banquet in England after the last war with a scientific commission. Among those present (according to the repeated story) was a Britisher with an extreme inferior complex who shouted out in resentment to the Americans that they had not delivered any engines during the war and that they could not run after they got there. Kettering, it was said, rose to his feet and replied, "Either the gentleman who just spoke is a liar or I owe him a drink."

Kettering then pulled from his pocket a notebook and read from it a list of the Liberty engine production day by day. Whereas Rolls-Royce, with 20,000 men, had been turning out 10 engines a day, our industry with not too many more men employed had been turning out 150 a day—engines which were 100 h.p. more than the then Rolls-Royce, 100 pounds lighter in weight and at least 50 per cent as costly to produce. Before Kettering had finished reading his data the Britisher arose, held up his hand and said laughingly, "I will buy the drink."

If the story could be told *right now* of what America is turning out *right now*—even leaving out what we will be turning out in six months from now—neither Germany nor England nor the rest of the world would believe that such an achievement were possible without years and years of preparation ahead of time.

A plant like Glenn Martin's original plant, which was then about the biggest in the world, came to a point where production was needed. A certain architect in Detroit got a phone call—and this, too, is hearsay but pretty good hearsay—Glenn Martin was on the wire. "Where will you be tomorrow, which is Saturday?" "Why?" "I expect to sign a contract tomorrow with the French and I want you to start Monday morning on my field in Baltimore to double the size of my plant in three months time."

Eleven weeks from the time of that phone call the buildings were finished and occupied—and that was only the be-

(*Continued on page* 106)

Artist's conception of a Russian I-16 in deliberate collision with Nazi bomber.

THE RAMMING RUSSIANS

by Lieut. ROBERT B. HOTZ

U. S. Army Air Forces

A "suicide" tactic of World War I has been developed into a scientific maneuver by Soviets.

ONE of the specialties of Russian airmen in their battle against the German air force is the tactic of ramming enemy planes. The sacrifice of a dying pilot in a damaged plane by a deliberate collision with his foe is a relic of World War I; but the Russians have developed ramming as a definite tactic from which both pilot and plane may escape undamaged.

Ramming was developed by the Russian airmen after they observed that frequently German multi-engined bombers escaped after being hard hit and seriously damaged by Russian pursuits. Often the pursuit pilot scored heavily, killing part of the bomber's crew and disabling one or more motors. However, these attacks usually exhausted the pursuit's limited ammunition supply, permitting the bomber to limp back behind its own lines. Ramming is designed to destroy these crippled planes. It takes a combination of skillful piloting and utilization of the crippled victim's lack of maneuverability to execute a sucessful ramming operation with a minimum of damage to the attacking pilot and plane. More often the attacking plane is damaged and the pilot bails out.

Soviet flyers employ three types of ramming, according to Maj. N. Denisov in a recent U.S.S.R. embassy bulletin. The most dangerous is the direct blow. Hitting the enemy plane with a part of a Russian plane and clipping control surfaces by slight propeller contact are also used. The latter method calls for the greatest skill but offers the best chance of survival.

Major Denisov points out that the propeller clipping method calls for an approach from the rear with the attacking plane's speed adjusted to that of the enemy. As soon as slight contact is felt the attacker must drop away to avoid crashing with the enemy plane as it falls. If the ramming flyer is too slow he may easily become entangled with the stricken plane and dragged down with it.

American Air Forces observers abroad report numerous examples of the Russian's ramming tactics and there are accounts available from Soviet flyers who have rammed German bombers and made successful landings. Here is the account given by Jr. Lieut. V. Talalikhin, who was awarded the Order of Hero of the Soviet Union for his exploits:

"On the night of August 6, 1941, when Fascist bombers made one of their attempts to break through to Moscow, I was ordered to take off in my fighter and patrol the approaches to the city. I soon spotted a Heinkel He-111K at an altitude of about 15,000 feet. Swooping down I managed to get on its tail and attacked.

"With one of my first bursts I put the bomber's right engine out of commission. The plane banked sharply and set its

(*Continued on page* 100)

THE INOFFENSIVE BATTLESHIP

by
CY CALDWELL

Are battleships now obsolete? Have carriers and land-based planes cowed "battlewagons" to the point of evading conflict?

☆

EVER hear the story about Marm Pugwash's game rooster? It was told by Sam Slick, the Yankee clockmaker, in a book written by Judge Thomas Chandler Haliburton of Nova Scotia, more than a century ago. Marm Pugwash raised game roosters for cockfighting, and over a series of years she had developed a strain of particularly heavy birds, finally achieving a massive specimen bigger, heavier and more formidable looking than any other rooster in those parts. There was just one thing wrong with him: he wouldn't do any fighting. He was as averse to fighting as Ferdinand the Bull.

This exasperated Marm Pugwash as much as it puzzled her. He looked like a fighting rooster, and obviously he packed an awful wallop if he ever cared to use it. But he wouldn't use it. Time after time lighter birds knocked the stuffing out of him, but he did nothing about it, except to flee to his coop. One day Marm Pugwash picked him up and said grimly, "Well, if you won't do any fighting, at least I'll make you do something useful to earn your keep." So she plucked all of the feathers out of his under parts, leaving his delicate skin exposed, then took a branch of nettles and gave him a good switching with it so his skin became somewhat inflamed.

In the henhouse was an old biddy sitting on a clutch of eggs. Marm Pugwash threw the hen off the nest and set the rooster down on the eggs. They were warm and comforting to him in his denuded condition, so he sat there, grateful for the warmth, and in due course hatched out a brood of chicks, thus justifying his continued existence, if not as a fighter, then as a mother.

Now it seems that the development of naval-air warfare has reached a critical point where the battleship bears a striking resemblance to Marm Pugwash's rooster. While it would be unfair to state that battleships won't fight if given the opportunity, it is evident that so far in this war they haven't earned their keep by active fighting. On its war record so far the battleship has been the huge muscle-bound booby of the high seas. It is a floating gun platform that seldom manages to float its guns into a position where they can do any damage to the enemy. After all, the purpose of any military weapon is to deliver blows to the enemy and thus destroy him or wear down his resistance. This the battleship has signally failed to accomplish. When the fighting starts the battleship isn't there; and it doesn't even get in at the finish, except in a few instances such as the *Bismarck*.

Is there something fundamentally wrong with the battleship in the light of modern war at sea? Is it not merely obsolescent, but now actually obsolete? Have carriers and land-based aircraft so thoroughly cowed the battleship that it doesn't dare seek action, but only evade it? If so, competent military authority should boldly face the fact, should study the battleship as Marm Pugwash studied her non-belligerent rooster, and then do something about it. If battleships can't or won't fight, why not turn them into mother ships for airplanes: in short, convert them into carriers? We know that carriers are useful. But how useful is the battleship?

We have already decided to delay further new battleship construction and to build 500,000 tons of carriers. If it is sound not to build more battleships, but to build carriers instead, would it also be sound to turn all of the present battleships into carriers? I merely pose the question; I don't presume to answer it. But someone in authority should answer it. My point simply is that so far in the war no American battleship or no Japanese battleship has fired a shot at another battleship. On both sides the battleship has served merely as a target for aerial bombs. If both opponents in the Pacific war theater are to devote their efforts chiefly to insuring that they end the war with all of the battleships they still possess, then it would have been better for the taxpayers of both nations if neither had any battleships at all to start with.

It certainly would have been much better for the English if they hadn't built the 35,000-ton battleship *Prince of Wales*, and sent it out to Malaya to be sunk by Jap bombs and torpedoed on its first voyage, along with the old 32,000-ton battle cruiser *Repulse*. Now just suppose that, instead of sending those two unfortunate vessels out there, loaded down with heavy guns, the English had thrown the guns away, torn off the massive upper works and turrets, ripped out the insides and turned them into hangars, and added a flight deck and a complement of fighters and bombers. Isn't it possible that those ships would still be afloat? Or isn't it certain that they would have had a much better chance of surviving the sea-air battle in which they sunk to the bottom with all their guns?

However, this is not to be construed as a plea to turn battleships into carriers. The British used two battleships in the wrong place, at the wrong time, under the wrong conditions. As I pointed out in an article at the time, the fault lay not with the battleship, but with the gentleman directing its activities. It simply should not have been there without air support. However, that is not to set down the rule that battleships should be regarded as sacred sea-cows and never used at all, except for convoy work and to sneak up under cover of darkness and hurl shells into Tobruk. But the battleship, I humbly submit, has become suspect in this war as a loafer, a beach-

(*Continued on page* 78)

Mrs. Evelyn J. W. Casola, Pearl Harbor widow, drills rivet holes in a bomber gun door at a giant aircraft factory.

Men and women work together at one of the west coast's huge aircraft plants. These two are working on a control panel.

WOMEN WORKERS WANTED!

by Brig. Gen. FRANK J. McSHERRY

Director of Operations, War Manpower Commission

More than an emergency wartime helper, milady has proved herself an invaluable addition to the aviation industry.

Gen. McSherry

IF I were a young woman this year of 1942—and by "young" I mean anywhere from 18 years up—I'd want to learn to build bombers.

I'd want to build bombers — or fighter planes or pursuit ships or transports—for two reasons. First, because I'd be doing something vitally important toward winning the war. But also because it would assure me of a trade which I could continue to work at after the war, if I wanted to, at good wages and without the feeling that I was keeping out of a job the man whose job I took when he went to war.

Now I don't set myself up as a prophet, but I can count; and when I put two and two together, I get the reason for that last statement—that I wouldn't feel I were keeping a man out of a job.

Nobody expects that when this war is over we're suddenly going to stop aircraft production. Everybody knows that the air services of the nation will be greatly expanded after the war and that more and more passenger and cargo planes will have to be built.

Add to that the opinions of some of the aircraft plants which are now employing sizable number of women, that *many of the jobs on which women are now working are being done better by them than*

(Continued on page 88)

FOR IDENTIFICATION

1

2

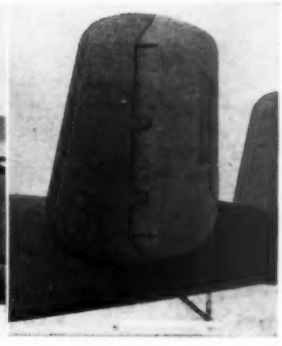
3

4

5

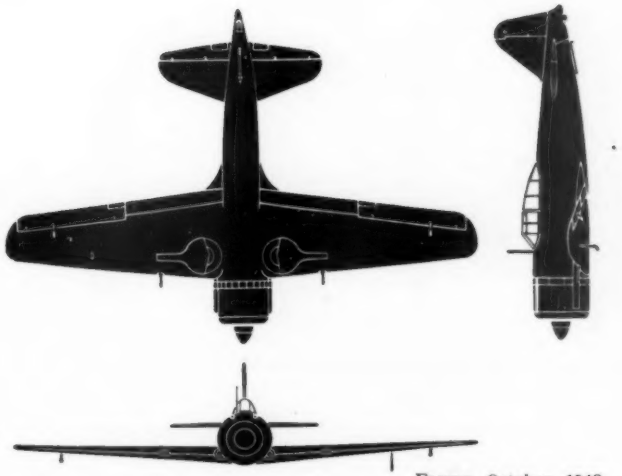
6

7



8

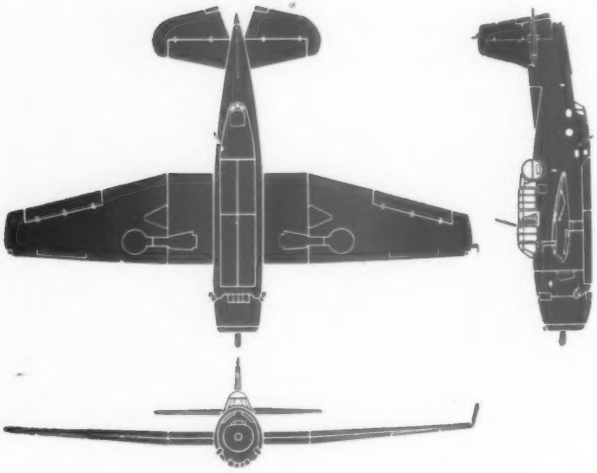
SINCE our August issue, containing the silhouette of Japan's Mitsubishi 00 (Zero) fighter, went to press, additional material has been obtained which has enabled us to revise the original drawing with greater accuracy. The new silhouette (right) is based on a series of photographs of Zero wreckage, supplied us by the U. S. Army Air Forces, and can be considered the most authentic silhouette of the Zero fighter now available in the United States.



The planes are: 1. North American "Mustang" (P-51); 2. Boeing "Superliner" (307); 3. Curtiss P-36A ("Hawk"); 4. Bristol "Blenheim" Mark IV; 5. Blackburn "Roc" RAF); 6. Douglas B-23; 7. Curtiss P-40F ("Warhawk"); 8. North American B-25 ("Mitchell").

GRUMMAN "AVENGER" (TBF)

Torpedo Bomber



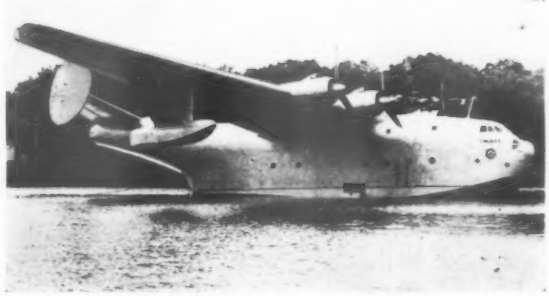
PERTINENT FACTS: Quietly in production for many months, the *Avenger* first was given wide publicity shortly after the Battle of Midway, where it had flown with conspicuous success against the Jap navy. This is the torpedo bomber that is gradually replacing the old Douglas *Devastator* (TBD), the Navy's torpedo bomber standby for years. The new Grumman, now in mass production, is a three-place, single-engined monoplane, probably in the 2,000 h.p. class. According to a Navy Department announcement, the *Avenger* has a top speed of more than 270 m.p.h. and can carry a 2,000-pound load (bombs or one torpedo) for a range of 1,400 miles. Its ceiling is said to be 20,000 feet. No armament details are available.

WHAT TO LOOK FOR: An ugly, deadly-looking airplane, the *Avenger* has many points that can be readily recognized by spotters. The side view is characterized by sharply angular lines similar to the Grumman *Wildcat* fighter. The *Avenger* is a mid-wing monoplane. The center section has no dihedral but the wing panels, from the center section out, have slight dihedral. The wing's leading edge tapers slightly and has a built-in slot just ahead of each aileron. The trailing edge tapers sharply outward from the center section; the latter has no taper at all. The vertical tail unit is typically the Grumman straight-lined, balanced controls. The landing gear retracts outward, fitting flush into the underside of the wing. In the side view, the *Avenger* looks hump-backed, with its greenhouse and gunner's turret perched atop the fuselage, while it tapers downward toward both the nose and tail. Also notable is the tail gunner's turret in the rear underside of the fuselage.

FLYING, October, 1942

MARTIN "MARS" (PB2M)

Patrol Bomber



PERTINENT FACTS: Currently being publicized as a prospective cargo plane, the Martin *Mars* is the world's largest flying boat; it was built for the Navy as an experimental patrol bomber. Powered with four 2,000 h.p. air-cooled engines, the *Mars* carries a normal crew of 11, but has sleeping accommodations for 13. Wing span is 200 feet, length 117 feet 3 inches, overall height, 36 feet. Fuel capacity is equivalent to a normal tank car load. While the *Mars* weighs 70 tons, the Martin company already has a 125-ton boat on the drawing boards.

WHAT TO LOOK FOR: Generally, the *Mars* is a conventional-appearing flying boat. Its cantilever wing has a small but readily seen amount of dihedral. When seen from beneath, the wing has slight taper in the leading edge and full-tapered trailing edge. The tips are rounded. The tail unit is distinctive, following the same Martin practice as used on the smaller *Mariner* (PBM). The elevator and horizontal stabilizer have marked dihedral; the twin rudders, subsequently, sit at an angle. Note that the wingtip floats are fixed. The only gun turrets to be seen on the *Mars* prototype are in the nose and tail.

FLYING, October, 1942

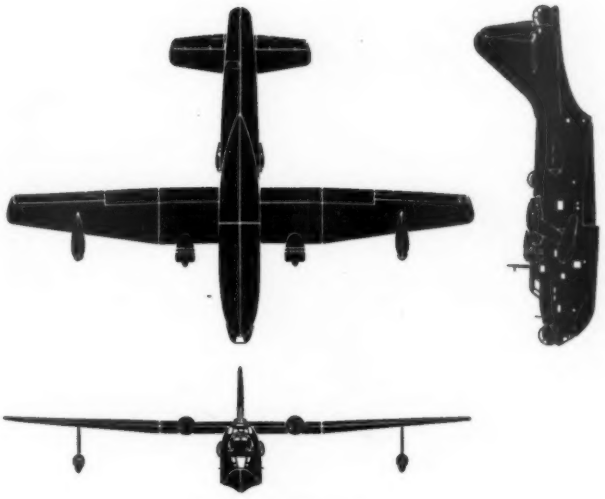
BOEING "SEA RANGER" (PBB)

Patrol Bomber

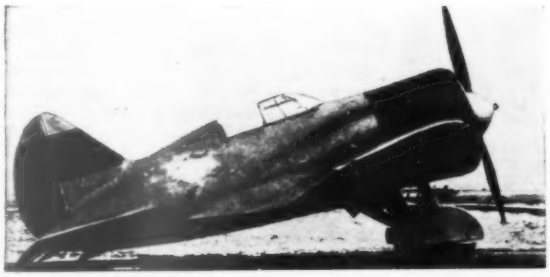
PERTINENT FACTS: Recently tested in Seattle by Boeing flight engineers, the *Sea Ranger* already is reportedly to be shelved until some later date, making way for additional production capacity for *Flying Fortresses*. The latest patrol bomber design yet produced for the Navy, the *Sea Ranger* is a twin-engined boat said to be in the four-engined class. Its engines probably are 2,000 h.p. radials. Further data on this aircraft are restricted; neither performance figures nor specifications had been released as this issue went to press.

WHAT TO LOOK FOR: The *Sea Ranger* is a high-wing, cantilever monoplane, with fixed wing tip floats. The wing appears narrow in chord when seen from beneath. It also should be noted that only the wing panels have taper, from the rectangular center section outward. The leading edge of each panel tapers sharply toward the rounded tips; the trailing edge has only a slight degree of taper. The cantilever tail assembly, in the underneath view, has equal taper and rounded tips. In the side view, the sweeping vertical fin is quickly seen. Also fairly prominent are the nose and tail "bubble" gun turrets; another such turret can be seen atop the fuselage just back of the wing. Gun turrets also bulge out of each side of the fuselage, and can be seen in the front view. Another point of recognition, in the bottom view, is the hull or fuselage which seems to be approximately the same width from nose to tail.

FLYING, October, 1942



Conditional drawing



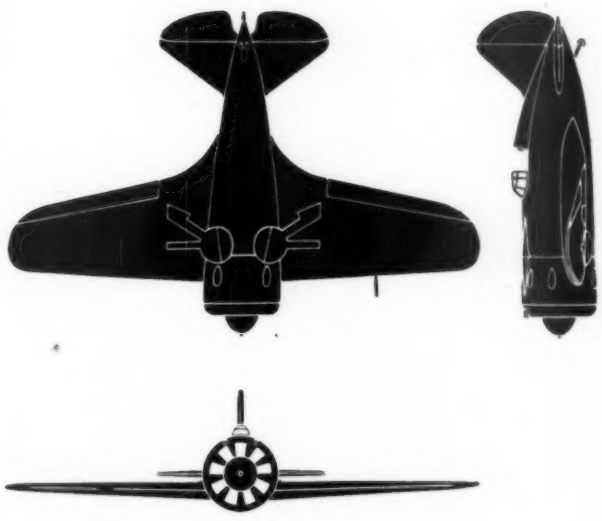
I-16

Fighter

PERTINENT FACTS: All Russian fighters bear the letter I; the I-16 simply is the 16th fighter model in the Russian air force. It frequently has been compared with the old Boeing P-26 in appearance. One of the older fighters still in use by the Red air force, the I-16 first made its appearance in any quantity in the Spanish Civil War. The model currently used is the I-16C, powered with an 1,100 h.p. twin row radial engine based on a Wright design. The original I-16, with a 750 h.p. engine, had a top speed of 279 m.p.h., cruised at 224, a service ceiling of 31,500 feet and a range of 500 miles. Armament of the I-16C is four machine guns or two cannon and two machine guns.

WHAT TO LOOK FOR: The cantilever wing is set up somewhat from the bottom of the fuselage, putting the ship in a low-mid-wing class. Trailing edge taper is pronounced, sweeping back to the fuselage with deep fairing that extends to within a few inches of the tail surfaces. The deep, chunky fuselage gives the I-16 as much of the "flying beer barrel" appearance as the Brewster *Buffalo*. The cantilever tail surfaces also are sharply tapered, with the vertical fin sweeping forward into a streamlined head rest behind the pilot. The sliding cockpit canopy fits into this fairing. The landing gear retracts inward, fitting partly into the wing and fuselage.

FLYING, October, 1942



PLANE SHORT CUTS

by KURT RAND

This 250-ton hydro-press with rotary table handles 20,000 parts in eight hours.

The aviation industry's successful race against time in its production program is symbolized by the streamlining of tools, machinery and methods.

AMERICA'S race against time and the tides of war in the production of aircraft is symbolized by the efforts of inventors, equipment designers and production engineers within the industry itself in devising new machinery, new tools and streamlined methods of achieving a swift, smooth and uninterrupted river of metal through the plants from receiving dock to the completed airplane.

Many short cuts to speedier production have resulted from this combined effort. Time-saving inventions, new methods and materials and better co-ordination of material handling equipment with stationized assembly lines and adjacent stockrooms have "cleared the decks" for an all-out action that will eventually strike home to the enemy with telling effect.

Lockheed Aircraft Corporation and its subsidiary, the Vega Aircraft Corporation, may be taken as typical examples of how aircraft manufacturers throughout the land have placed their brains as well as their shoulders to the wheel. Of paramount interest and importance at this time is the story of how production of *Flying Fortresses* under the Boeing, Vega and Douglas pooled facilities program has been advanced six months through the use of an electrolytic transfer process by which the master pattern, or work template, can be reproduced in five minutes.

The template is the same thing to aircraft manufacturers as the tailor's pattern is to the making of a suit of clothes, and no work can be done on a given part in the shop until the corresponding template has been drawn, made and cut out to within a few thousandths of an inch.

"There was in existence only one complete set of these templates for the B-17 *Flying Fortress*," declared Mac Short, vice president in charge of engineering at Vega. "This set was at the Boeing Aircraft Company plant in Seattle. Duplicate sets were needed at both Vega and Douglas to enable those two companies to start work. The electrolytic transfer process, invented by Clarence O. Prest, was utilized as a means of eliminating the tedious, time-consuming hand reproduction of these duplicate working patterns, effecting substantial savings of both time and money.

"Twenty-seven men from the Vega template group spent four months in Seattle reproducing 28,000 templates by hand from the master boards of the Boeing company. Each of these 28,000 patterns was sent to Burbank where reproductions were made of each template by the new electrolytic process which required only five minutes for each reproduction.

"Complete sets of templates were turned out for Douglas, others were retained by Vega and duplicate sets were sent Boeing to back up the master set from which the Vega men had made the drawings by hand. This saved each company about 50,000 man hours, or a total of some 150,000 work hours that would have to be completed before any manufacturing of parts, tooling or jig building could even have started."

The total cost of template layout copying by this new method, including labor and materials, has been found to be less than 10 cents per square foot of layout area, as contrasted with $1 per square foot by hand.

Simple machine speeds bending of tubing.

New workers quickly learn installation procedure by study of perspective sketches.

There are only three steps in making work templates by the electrolytic process: the preparation of the original drawing by an engineer, the scribing of the drawing on a specially treated metal sheet to make the master layout (which is the point in the operation at which the Vega men began work in Seattle); and the transfer of the scribed layout (with all the detailed information noted on it) to an inexpensive metal copy sheet from which the work template is cut. The copying operation is routine and can be taught an unskilled employee in a comparatively short time.

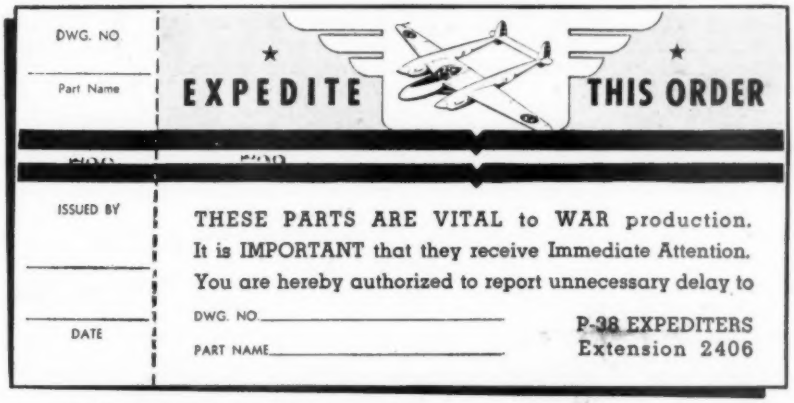
Under the conventional hand method, each time a work template is needed, it is necessary to scribe laboriously a duplicate copy of the master layout on a metal sheet, using the master as a reference drawing. This may require hours, days or weeks, depending on how large and complicated the master drawing may be. Once the master template has been made, under the electrolytic process, it can be copied in a few seconds.

Furthermore, the electrolytic process eliminates the danger of errors being made each time the master layout is copied, and assures the exact reproduction of each work template, regardless of how many there may be. To the production line this means that the parts made from these templates will be interchangeable and will exactly match every other part with which it is being assembled.

Any desired number of copies can be made from the master plate.

Similar to the electrolytic templates in their effect of speeding things up on the production line are the production illustrations. These are isometric drawings, photo-tracings or other perspective sketches placed on bulletin boards alongside the jigs where corresponding parts are being assembled. These drawings

(*Continued on page* 64)



Nothing is permitted to delay immediate action when P-38 orders carry this tag.

Lockheed worker won $2,500 award for his invention of remote-control rivet bucker.

PAT

by RAY NATHAN

Telling the world about aviation is vocation as well as avocation of talented Patricia O'Malley, enthusiastic press relations chief for the CAA.

"HEY, boss, there's a dame named Pat O'Malley wants to see you," the office boy informed the city editor of a large metropolitan newspaper.

This particular editor felt that newspaper offices as well as barber shops should be sacred to men, but Pat O'Malley was an exception to his rule.

"Show her in," he said, with the afterthought, "unless she has that Joan of Arc look on her face."

Anyone who has ever seen Pat in action crusading for aviation will know what he meant. For 16 years, she has been spreading the gospel of aviation, with such irresistible enthusiasm and charm that a hard-boiled city editor would automatically raise his guard.

Today, as press relations chief for the Civil Aeronautics Administration, she is still the militant apostle for aviation, in a world where it commands far more respect than when she began her colorful career.

As a matter of biographical record, it might be mentioned that she was given the name Anna Catherine Patricia Regina Mary at the christening in Manchester, N. H., but none of her friends has been heard to call Pat by any other name than that of her patron saint.

"You'd be surprised what some of them have called me," Pat remarked recently. But the fact is that if the men who stream through her office call her anything but Pat, it's usually something like "sweetie-pie." All over the world, where aviation people gather, you're likely to hear them speak affectionately of Pat O'Malley. As this is written Bill Dunn, Pat's ex-chief in American Airlines publicity, broadcasts news from Australia and a letter arrives from another friend in San Francisco, saying that the night Dunn embarked for the Orient he and the writer drank a last toast to O'Malley.

Pat O'Malley rules the roost in this corner of the CAA's Bureau of Statistics and Information. As CAA's press relations chief, Pat must know all the answers.

Pat says that men are the only interest in her life rivaling aviation. The latter seems to be still in the lead, although a certain captain in the Air Forces is offering tough competition. Meanwhile, she lives with her mother in a Washington apartment where the telephone company is considering installing a private long-distance wire.

She obtained her schooling at the Convent of Mercy near Manchester, followed by two years at New York University. Fresh from the journalism courses of the latter institution, and offering as experience four summers on the home town paper she sallied forth prepared to set the newspaper world afire, but found it had a thick outer crust of asbestos.

After a brief interlude free-lancing in Providence, R. I., she tried Chicago. The big papers of that city were studded with star reporters of "The Front Page" era, and had little use for a girl graduate. She was about to give up, when she came across a friend who had just bought the East Chicago-Indiana Harbor *Twin City Septinel*. He gave Pat a job on that grandiose-sounding sheet, but the job and publication lasted only long enough for the owner to find out that 90 per cent of the Twin City residents could read nothing but Polish.

Pat thereupon headed for Washington. While in Providence, she had taken a Federal civil service examination just to provide company for a frightened friend. Once in the capital, she found that her passing grade on that exam opened doors. It opened a door at the Navy Bureau of Aeronautics, on which they were painting a brand new sign that read "Press Room." Pat walked through that door in 1925, sat down, and for 16 years since has been writing, talking, breathing aviation.

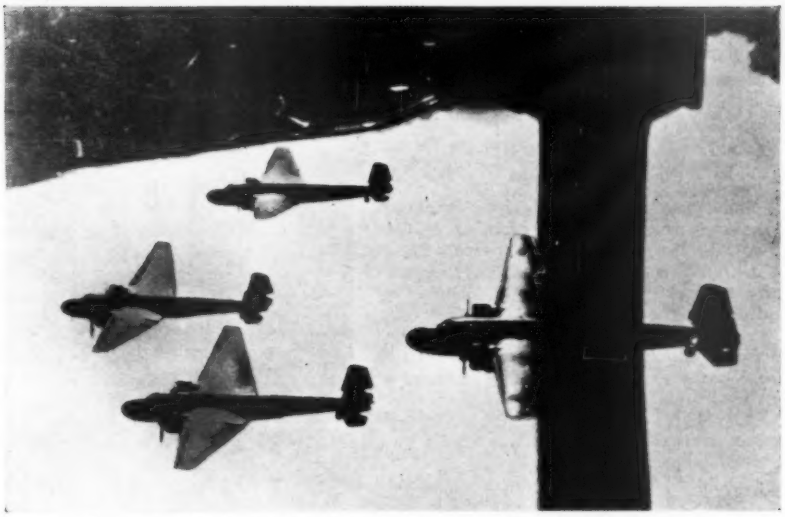
The newly founded press room was a hectic place between 1925 and 1929. "One day I would be publicizing a new record made by a Navy aviator, and the next day I would be attending his funeral," is the way Pat summarizes it.

In that period, there was little commercial aviation worthy of the name and it was up to the services to advance the cause of flying. Congress was not inclined to furnish them with funds for laboratory research, so many a young aviation enthusiast in the Navy made a flying guinea pig of himself. Some of their stunts were in the interests of pure science, others show the publicity brain of Miss O'Malley, who realized that the public had to be made conscious of aviation if it were to survive and grow strong. She recalls particularly a parachute jump into the Potomac by a Navy man carrying a small rubber boat, and the altitude and other records made and as quickly broken by the brothers Soucek—Zeus and Apollo.

After four exciting years, Pat received an offer to come to New York and do publicity for a new firm that existed only on paper but planned on going into the airline business in a big way. Heeding the advice of her colleagues, Pat decided that this was a real opportunity.

(*Continued on page* 113)

An expert on the Far East has studied and flown with Jap airmen. He believes they will lose.



Jap flyers seem indifferent to targets, bombing anything, anywhere, at any time.

I HAVE FLOWN WITH THE JAPS

by LAWRENCE IMPEY

For 20 years the author has worked and lived in the Far East. He was one of the first men to recognize Japanese aims and spent nearly 10 years trying to warn his fellow Englishmen of the danger, through dispatches to the London "Daily Mail," for which he was Far Eastern correspondent from 1925 to 1941. As the "Daily Mail" war correspondent, he served through the Malayan and East Indies campaign, narrowly escaping from Singapore.

MY FIRST contact with Japanese aviation was made at the commencement of the Sino-Japanese conflict in Manchuria in 1932, and I have been watching their steady progress ever since that date.

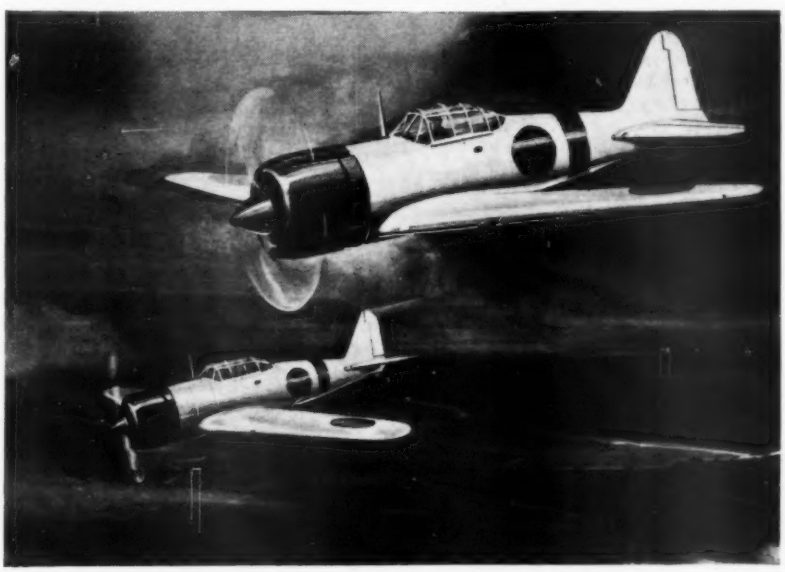
At that time, when the Japanese seized Mukden in a *coup d'etat*, and later proceeded to occupy the whole of Manchuria, they were, in my opinion, very indifferent aviators.

They were flying some antiquated single- or two-seater single-engined planes manufactured in Japan under license from the Dutch firm who designed Fokker planes for the last war. They operated a single machine gun firing through the propeller. At the same time they had a few bombers somewhat resembling the early type of Bristol *Blenheim* bomber.

As far as fighters were concerned, they never had to use them for anything but scouting and observation, for there was no opposition in the course of the Manchurian conflict. The Chinese had some Breguet and Farman planes purchased from the French after the war in 1920, but they made not the slightest attempt to use them. Which was perhaps fortunate, for the Japanese captured them on the field at Mukden and used them in maneuvers shortly afterwards, when they promptly fell to pieces, causing heavy casualties.

I flew on three or four occasions with the Japanese during the Manchurian campaign and noticed two things about them in particular. One was that they seemed to be entirely indifferent as to their target, and would bomb a market town, a village street, or even farmers and women in the fields just as readily as they would a troop train or a column of soldiers. The other factor which differentiated them from aviators in other lands was that even in the bitter climate of Northern Manchuria they would dispense with the usual warming up of their planes first thing in the day.

Best fighter ever developed by the Japs is the famed Mitsubishi "Zero." This sketch, by Herman R. Bollin, FLYING art director, is based on U. S. photos of "Zero" wreckage.



They just cranked them up after a brief preliminary inspection, and if the prop turned over they said "good," climbed in and took off for their destination.

I don't know whether it is a kind of fatalism that works in them, or what. For example, I remember that in Mukden after a day's fighting there were planes belonging to two rival Japanese newspapers waiting for pictures of the battle. It was imperative to rush these to Japan as soon as possible. But one plane was a small type with insufficient fuel for the trip. It was a sheer impossibility for that plane to do the sea flight. But the other plane could make it. So they both took off at the same time, and the smaller plane crashed somewhere out at sea and was never seen again. It is difficult for us to understand such a mentality.

I have flown with Japanese military aviators in shoddy old single-engined Fokkers in the Jehol campaign, where we were flying from a pocket handkerchief field in the foothills, and soaring over 12,000-foot ranges where a landing was an impossibility—and even a crash would throw the pilot, if he survived, into the hands of an implacable Chinese enemy. But tuning up their machines or using a twin-engined model never seemed to occur to these little Japs. They just took off and took a chance.

Then when they got down into China proper and attacked Shanghai and Nanking, they brought some better stuff into sight. Faster planes and better bombers began to make the Chinese sorry for themselves—though even then they didn't have any great success, considering that the Chinese air force opposing was almost non-existent. The only part of it that functioned well was the small portion commanded by American flyers, who were really doing a good job as far as the circumstances permitted. The Chinese pilots were individually brave enough, but they had little experience and no actual training in formation flying and fighting.

It is interesting to note that the Japanese army had been mainly responsible for military aviation up to 1937, but after unsatisfactory work at Shanghai and Nanking, and a bad flop in an attack on Hankow when a number of Jap planes were shot down by Russian aviators loaned by Moscow, the command of the air force mainly passed into the hands of the navy.

There has always been considerable rivalry between the two branches of the service, and the navy are a far smarter and more intelligent body of men, particularly in their approach toward political problems abroad. For while the navy fully appreciates the fighting value of foreign navies and air forces, the army is in the main convinced that the Japanese army is the best in the world, the Chinese second best, the German army worth mild consideration and the rest rated nowhere at all. I have heard Japanese military men, after a few drinks, maintain this argument with the greatest

(*Continued on page* 91)

FROM HEADQUARTERS

by Lieut. Col. HAROLD E. HARTNEY (A. F. Res.)

Harold E. Hartney

DOWN here at headquarters, two unfortunate misconceptions, based upon plain ignorance, worry many of us but not your correspondent. The first is that this war is being bungled by the United Nations, and the second, that Great Britain is not going "full out."

Both of these ideas are as silly as they are dangerous. When a bandit gets loose in one's town and is shooting up the place, one does not stop to criticize the police force or blaspheme his neighbor who is trying his best to shoot him down. The job is to get rid of the outlaw first, and argue later.

* * *

As I write, many are fearful that the Russians will collapse; that this will be followed by an invasion of Britain and her consequent capitulation, and that then the Axis will have in their control 1,350 war vessels while we in the United States will have but 350 available. They shudder when they picture the Atlantic and the Pacific both under the domination of the Axis.

Shame on all these crepe hangers!

The losses suffered so far are the price we had to pay for unpreparedness. They are the cost of gaining time—time to help us get mobilized and in production, time to enable Russia to get ready for her treacherous, double-crossing enemy.

Hitler was delayed at least six weeks on his invasion of the Caucasus and this delay alone was worth all the losses Great Britain and the United States have suffered to date.

* * *

Col. Dudley Watkins, chief of the Proof Section, Proving Ground Command, AAF, has the distinction of having six sons (including Sgt. Robert Watkins, torpedoed at sea and lost) in the armed forces of the United Nations; Capt. T. H. Watkins is commanding officer in an attack squadron abroad; Lieut. John Watkins is at an advanced training depot here in the United States; William and Woodruff Watkins are in the RAF; Lieut. Dudley Watkins, Jr., is at an ordnance proving ground.

* * *

We had only two generals in the air forces in World War I. Now we have 83—five lieutenant generals, 23 major generals and 55 brigadier generals.

The youngest general in the American Army, General Kuter of the Army Air Forces, uttered the best remark I have heard since my last column, at a recent press conference. He said: "The Japs are caught between two Chennaults," referring to General Chennault in China and his son in Alaska.

General Arnold commented the other day that Tokyo should be informed of the fact that we have plenty more Chennaults (one is at Biloxi, Mississippi, and another is in the Navy) all rarin' to go.

* * *

The female spotters are doing pretty well even though one the other day, on seeing a P-38 going over, called up and reported "couple of fast planes going over with their wings embraced around each other."

* * *

Too bad the publicity in Alaska and at Midway had to come through Navy channels where Naval officers are in supreme command; the story direct from the Army Air Forces has yet to be told.

Major General Harmon is credited with a remark almost as good as Kuter's and one that will go down in history. He said: "The Navy is the first line of defense but the Air Forces is the first line of offense."

* * *

Many people write me enlisting advice or aid in obtaining appointments. One wrote me last week, and when he had no reply within seven days, he wrote, "You evidently did not pay any attention to my letter, for I have not received my commission."

* * *

Another officer in Colonel Ennis' Air Forces Public Relations Office who was in the U. S. Air Service during World War I is Maj. Nathaniel F. "Niel" Silsbee, chief of AFPRO's information and education division. The story goes that while Niel was writing a weekly newspaper column, various magazine articles, etc., his close contacts with the aircraft industry brought him so much information that his requests for dope from the War Department were so detailed, Colonel Ennis finally threw up his hands and decided to bring Niel in and let him answer his own questions and, incidentally, build up a much needed set of information and research files for general use.

* * * *

Our old friend, Col. "Chuck" Kerwood has just completed an industrial morale-building film for use in airplane factories. It is called "Combat Report" and the boys in the Chief's office noticed that Chuck still had some grease paint on his cheek when he reported back.

* * *

Congratulations to Lieut. Col. Joe Edgerton, the hardest working man in Colonel Ennis' organization! Merit wins promotion in this war and none won greater general acclaim than Edgerton's move up another rung on the ladder.

* * *

"Billy" Street, now a brigadier general,

(*Continued on page* 110)

The Billy Mitchell Case

by Rep. MELVIN J. MAAS
Now on active duty with the U. S. Marines

General Mitchell poses with Eddie Rickenbacker (left) during a hearing in Washington in October, '34.

The tempestuous military career of the fiery general draws to a close. He is tried and found guilty of his conduct, not his far-sighted ideas.

Concluded from the August issue

Maas

TYPICAL of editorial reaction among the newspapers was that of the New York *Times* that "this is not language becoming an officer and a gentleman." This paper, hitherto quite friendly toward Mitchell and laudatory of his abilities, said that "his wild and whirling words sound like those of one running for office."

"And with immense and almost grotesque cocksuredness," added the editorial, "he sets up his own judgment against that of every authority in the Army and Navy, not merely in the matter of aviation, where it may be that he is half as great an expert as he professes that he is, but on the whole subject of Governmental policy and Congressional legislation."

To all of this Mitchell replied that it was the War Department's policies that were on trial, not he.

Rear Adm. William A. Moffett, chief of the Navy's Bureau of Aeronautics, commented that "the most charitable way to regard these charges is that their author is of unsound mind and is suffering from delusions of grandeur." But Representative Curry proposed that Mitchell be promoted immediately to major general.

Meanwhile, the colonel himself, relieved of active duty by the commanding general of the Eighth Corps Area to preserve discipline, had arrived in Washington, to be met at Union Station and carried to the street on the shoulders of cheering American Legionnaires and later to be the guest of honor at a Legion barbecue.

While the country awaited the department's official action against Mitchell, President Coolidge appointed a special board with Dwight Morrow as chairman, to study and recommend legislation on the whole problem of military and commercial aviation in the United States. The board already had begun its hearings, with General Patrick advocating a unified and separate air force as one of three equal arms in a new, single War Ministry as the best solution of the military air problem. Pending that, he suggested reorganization of the Army Air Service as a separate corps of the Army, similar to the Marines in the Navy Department. This suggestion later was adopted in large part in legislation which created the Air Corps.

Soon after Mitchell reached Washington Dwight F. Davis, who had succeeded Weeks as Secretary of War, announced that the colonel would be tried before a court-martial in the capital for insubordination and conduct prejudicial to discipline and, on October 20, he announced that the specific charges, of which there were several, all involved violation of the Ninety-Sixth Article of War.

This article says in part that "all disorders and neglects to the prejudice of good order and military discipline, all conduct of a nature to bring discredit

(*Continued on page* 58)

PRIVATE FLYERS TO THE RESCUE

by RUSS JOHNSTON

Air patrolling of west coast forest lands as a protection against saboteur's torch, is urged as a defense service the CAP could capably perform.

THIS month and next the timberlands of western America are especially vulnerable to that age-old enemy . . . *fire.*

Today, more than ever before, it is absolutely essential that these great forests be protected, for a raging forest fire today means more than just loss of timber—it means loss of time, vital to war production; money, vital to purchase of war goods; and loss of man-power vital to winning the war.

Moreover it means disrupting communications, slowing up of military training, and turning aside from our primary job of winning the war.

Needless to say, every precaution is being taken to protect these timberlands from fire, but the job of patrolling hundreds of thousands of square miles of forests is a tremendous undertaking, one that taxes to the limit our present system of observing and controlling forest fires.

Now, if you've never seen a forest fire at work you won't be much alarmed at this prediction. But if you've ever watched 5,000 men battling night and day against flames 400 feet high, whipped into a frenzy by a 30-mile gale, you'll know that of all fires, a forest fire is the most terrifying and destructive.

And if a carelessly tossed cigarette can put 5,000 men to work fighting a grim battle against fire, *what will a dozen or so carefully planned and simultaneously lighted fires do to our defense effort?* I'll tell you.

It will put 20,000 men and women, who could be doing something else in our national war effort, to work fighting a fire that will ravage millions of dollars worth of timber and lay to waste millions of acres of virgin land.

It will tie up hundreds of miles of vital traffic arteries and railroad lines.

It will destroy oil pipe lines (which run through the brush covered slopes) and undermine and break water supply lines.

But most important of all, if set in certain areas, these fires will destroy the high voltage lines which feed Southern California's vast aircraft industry.

All this is of such common knowledge that it cannot be known to certain Japanese aliens whom the FBI may have failed to contact. It is of such vital interest to our war effort that plans should be made to combat this danger before it arises.

I write from close observation of forest fires. As a member of the Columbia Broadcasting System's special events crew I have often seen these ravages at close range. As a pilot I have watched them from the air, and have made studies of the fire control and methods of fighting them.

Actually there is no way to put out a forest fire. What the United States Forestry Service and the many different auxiliary organizations try to do, is to *isolate* the fire, then let it *burn* itself out. There is only one way to beat a forest fire, and that is to detect it and isolate it *before it gets well started.* And the only way to detect these fires in their early, controllable stages is by an efficient and constant air patrol.

What about the regular Government methods of spotting and checking these fires?

Look at this picture for a moment. Scattered widely, on the highest peaks, sometimes 20 or 30 miles apart, are the lookout stations of the Forestry Service. These lonely posts are manned 24 hours a day by men who are on the lookout for

This Piper "Cub" is used in Clark National Forest, Mo., for detecting fires. Lightplanes are well suited for this work.

A Stinson "Reliant" of the U. S. Forestry Service. Use of two-way radio enables pilots to direct work of ground crews.

that telltale wisp of smoke which indicates a fire.

In peacetime these men have done a wonderful job of singling out and reporting fires. Their educational campaign has been even more effective. But what Japanese or other saboteur is going to start a fire within easy spotting distance of one of these stations? And what well trained saboteur such as Germany sent to this country recently is going to leave the watch towers' telephone lines uncut? These rangers have learned from bitter experience that by the time a column of smoke, three canyons and 10 miles away, has reached such proportions as to be seen, *it already is out of control.*

Here, then, is the need for quicker detection and faster reporting of forest fires. This can only be done by a 24 hour a day air patrol, and such a job can be undertaken at a moment's notice only by planes and pilots of the Civil Air Patrol.

Spread out a map of Southern California (take the CAA sectional). Looking from left to right, we have the heavily-timbered Sierra Nevadas running north all the way to the Oregon state line. Just south are the Temblors, and the Calientes, and the San Rafaels. And there's the Santa Ynez range just back of Santa Barbara. But more important are the San Bernardinos and the San Gabriels between whose lofty peaks the mighty Boulder Dam power line passes. These mountains burn at the drop of a hat each year anyway. What will they do if the well-applied torch of sabotage is used on them under ideal weather conditions?

The United States Army does not have available from other duties enough planes and pilots to do this job adequately. Besides, the use of military aircraft is far too risky and expensive for such a task. It is not good economy to use planes burning 200 gallons of gasoline per hour to patrol a stretch of forest, when a young man in a Piper *Cub* can patrol it at less than five gallons per hour.

What's more, I believe the lightplane pilot can patrol it better and more adequately. He flies lower, slower and hence has more time to look for that tell-tale wisp of gray smoke. The terrain to him has more detail than one sees at 200 m.p.h. (Under adverse wind conditions this work could be assigned to heavier-powered, more stable airplanes.)

There probably are 1,500 private airplanes of all types grounded in Southern California right now. There probably are 2,500 licensed pilots who have joined the CAP and are awaiting orders. Civilian aviation in Southern California, to my personal knowledge, is in sound capable hands. For 10 years Los Angeles has at its immediate call the famed Sheriff's Aero Squadron, of which I as a member have had the opportunity to watch work at close range. This squadron now a part of the CAP can go to work tomorrow as a self-contained, radio co-ordinated unit.

Of course, these young pilots are going to be required to have two-way radios. They are going to have to patrol prescribed areas at certain times at specified altitudes. They will have to operate under rigid control so as not to foul the defense filter system, but this experience will make them better flyers and more able to meet Uncle Sam's call when it comes.

The West Coast's Interceptor Command, on the other hand, will have its share of headaches. Theirs will be the problem of how to keep the CAP coordinating their elaborate defense filter system. So far the attitude has largely been, "Keep CAP on the ground, we have enough problems." But I wonder if even the Interceptor Command would like to take over the responsibility for the task I've just outlined in addition to their job of keeping the Japs away.

Here is where national defense and civilian defense must solve a common problem. I have plotted, for my own satisfaction, flight patrol courses for private

planes which I firmly believe would adequately cover the situation. I have been careful to keep these courses from going over or even near the airplane plants or other "vital areas" or otherwise fouling military installations.

Of course, there is always the danger of a civilian pilot getting lost in marginal weather and wandering into an area where he shouldn't be. That will have to be solved by the operations officers of the CAP and by the "men behind the antiaircraft guns."

Let's look again at the map. (Take the Regional No. 11M.) From existing airports dotting the San Joaquin Valley civilian pilots can easily cover the west slope of the Sierras. There's Stockton, Modesto, Merced, Madera, Fresno, Visalia, Delano and Bakersfield, just to mention a few.

In the vital San Bernardino area there are airports every 10 miles. Alhambra, Monrovia, Pomona, Ontario and Riverside. On the north side of the mountains there are Palmdale and Victorville. By drawing 120 mile flight courses (which is two hours' range under climbing condi-

Stinson Model "A" chartered to haul cargo. Heavy equipment is often flown to scene, dropped by parachute to crews on ground.

tions in a *Cub*), every inch of these vital areas can be patroled. For the more lofty mountains and the more remote stretches, larger planes (Fairchilds, Stinson *Reliants*, Wacos, Beechcrafts) can be used. Flights should be short and a constant running radio report should emanate from all planes on a staggered schedule.

Let's say one of our young flyers spots a fire. What happens then? Maybe it's only a camper in an area where he shouldn't be, or maybe it's a Jap. Our flyer has a blown up map of his sector criss-crossed with lines. "Smoke of such and such intensity showing at such and such an intersection," he reports to his base.

Because his transmitter is low powered he does not interfere with operations on the same frequency farther north or south. But he is clearly heard by his "home station," which calls the nearest defense point and within minutes men are at the scene of the fire. After reporting the fire, the observing plane con-

(*Continued on page* 112)

VICTORY WELD

by PAUL PIERCE

Helium, that rare and exclusively American gas, has gone into action on the welding front for the duration.

THIS is no military secret, so Berlin and Tokyo papers please copy. America's fighting planes are going to be faster, stronger, lighter and more easily built than ever before. Furthermore there'll be no shortage of the material with which to build them no matter how many planes it takes to lick the Axis. For this we can thank a group of hard-working engineers at Northrop Aircraft, Inc., Hawthorne, Calif., who have given heliarc welding to America's war aviation industry.

This new method of arc welding has made possible the use of a new material for aircraft construction which lies in inexhaustible quantities in the ocean waters off our shores, is found in many common mineral ores, can be pumped from brine wells, in short the most abundant metal on earth—magnesium.

Magnesium has been used for some time in the aircraft industry for engine parts, wheels and cast accessories of many kinds, but until now it has never been used extensively as a primary construction material because of the difficulty of fabricating. Heliarc welding will make possible the substitution of magnesium alloys for aluminum alloys and leads to tremendous advantages both in airplane manufacture and performance.

Because of the construction of huge new magnesium plants, and increased production in plants now in operation, magnesium alloys will be cheaper than aluminum alloys in a very short time. Twenty-four thousand kilowatt hours of electricity are required to produce a ton of aluminum from bauxite and only 18,300 kilowatt hours are needed to turn out a ton of magnesium which has 54 per cent more volume — one and one-half times the amount of actual metal. There's a tremendous power saving to start with.

While magnesium is the hot stuff in an incendiary bomb, magnesium alloys are not inflammable when properly processed; in fact they are more resistant to direct flame than aluminum alloys. Although magnesium alloys are 35 per cent lighter than aluminum alloys and only 21 per cent the weight of steel, their weight strength ratio compares favorably with aluminum alloys, and they possess properties of stiffness and rigidity that cannot be obtained in other alloys.

It's easy to see why engineers in every aircraft plant in the country have been working on plans for magnesium planes. It's the ideal metal for aircraft, but until now there has been no way to put pieces of magnesium together to form the super planes of tomorrow. Heliarc welding seems to be the answer, and it has also proven successful in the welding of stainless steel, brass, Monel and other metals that are hard to weld.

Briefly—and somewhat technically—in the heliarc welding process, a shield of helium gas envelops the molten metal. Because helium is an inert gas, it prevents oxidation and eliminates the use of a flux and the danger of entrapped flux in the weld ingot that would promote corrosion. The arc in this process is produced directly between a tungsten electrode and the base metal rather than between two tungsten electrodes as is the practice in atomic hydrogen welding.

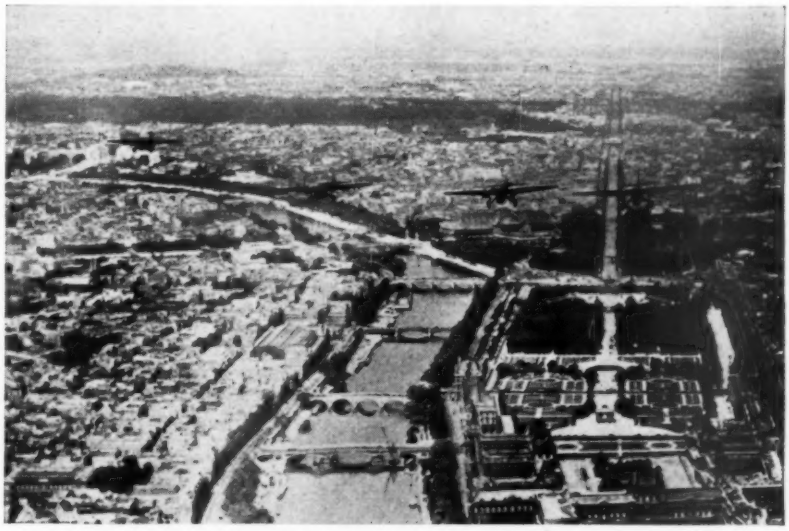
The Northrop heliarc welding torch is equipped with a helium valve that is opened just prior to the striking of the

(*Continued on page* 90)

Why French Aviation Failed

An Exclusive Interview with MICHEL WIBAULT *by Maria de Blasio*

As director of the French government's Arsenal d'Aeronautique, M. Wibault was in a position to observe at first hand the poisonous fangs of recriminations, lies, dishonesty and treachery leading to the dissolution of the French army's air force and the ultimate downfall of France. One of the world's outstanding plane designers, he now is in U. S.



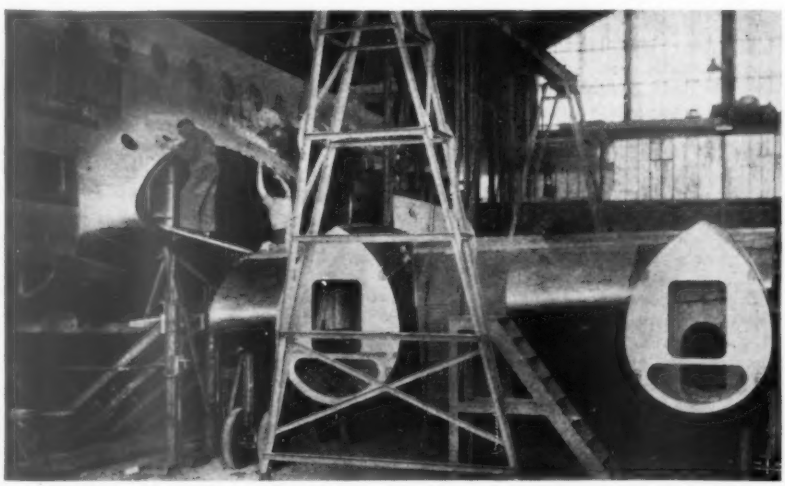
One of the obsolete types of military aircraft with which France entered the war.

MILITARY inertia regarding mass production, lack of money and time, and long delay in the obtaining of tools and raw materials were to a large extent responsible for the military defeat of France.

"It was not the construction of planes, nor the Popular Front, nor Pierre Cot, nor the workers," M. Wibault told this correspondent. "One of Germany's best propaganda jobs was the spreading of false reasons for the military collapse of France." Wibault recalled a remark made by General Gamelin at a meeting in March, 1940: "Gentlemen, your ideas of aerial warfare are dreams".

Wibault's condemnation of the French Senate from 1930 to 1940, is sweeping. Its financial commission, under the influence of the army leaders and political string-pullers, refused credits to the aviation industry to allow them to organize for mass production. This situation was sharply brought home when, in June, 1936, the air ministry revealed the financial condition of the Air Ministry. After payment of salaries to government employes, soldiers, petty officers and officers of the air corps and after paying for supplies, etc., the budget allowed for only 12,000 skilled workers at 30 hours a week. At that time construction of a French fighter plane required between 8,000 and 12,000 man hours, (not counting the manufacture of engines, propellers, accessories and armament), a medium bomber from 12,000 to 16,000 hours, and a heavy bomber from 24,000 to 30,000 hours.

It was not until a year later, but before the "Anschluss" of Austria to Germany, that the French senate finally began to feel uncomfortable about the rapidly growing Luftwaffe. Only then did they vote sufficient money to start mass production. But this left less than two years for France to catch up with Hitler. Even with money voted, the situation was not much improved. Most of the factories were old. Much of the steel and machinery had to be imported. Banks for many years had refused loans to the aircraft industry; aviation stocks never were introduced to the public on the Paris stock exchange. Most machine tools and other types of equipment had to be bought in the U.S. Sometimes delivery took as long as nine months. French heavy industry was not prepared for the immediate, large-scale production required of an all-out war program. Never at any time had it produced the quantities that would be needed. In the main, these were the factors which prevented France from becoming a formidable air power.



Mounts, permitting engine installation in 3½ minutes, were designed by Wibault for this transport, largest then in Europe and almost completed when France fell.

Another tragedy, M. Wibault pointed out, was the fact that this unused technical skill of French airplane designers was particularly high. The then-new French prototypes were ranked among the finest in the world and all were ready for mass production. However, Wibault's talents, and those of other famed French aircraft manufacturers, was devoted mostly to commercial types or to experimentation, not to quantity production of military planes. For the latter, money was needed which could not be obtained. Contrary to the popular belief that has scored the nationalization program of the French aviation industry as a political maneuver, Wibault declares that the primary aim of the program was to provide capital for the manufacturers, the government being the banker.

Wibault admits that in the beginning he, as well as most of the other manufacturers, was opposed to the nationalization but that, like almost everyone else, he soon was converted when he realized

that this alone would bring a semblance of organizational efficiency into France's air preparedness. Because of insufficient funds the French air industry was necessarily being conducted more like a medieval craft than a modern industry. M. Wibault criticizes the U.S. aircraft industry of 1937-39 just as severely. Based on his investigation of both the Russian and the American aircraft industries of that period, he declares that Russia could have produced in 15 days what the U.S. was turning out in a year. In 1936 he saw one factory in Moscow produce two four-engined, 20-ton ships and six twin-engine planes in one day. This factory, like many others in the U.S.S.R., was even then operating 24 hours a day, using a staff of 24,000 employes.

After the nationalization of the industry in 1936, Wibault resigned at the request of the Air Ministry, in order to organize the government's Arsenal d'Aeronautique and to be its director. The arsenal was a highly secret organization

A "Blenheim" bomber flown by the Free French forces in Libya. Note insignia.

devoted entirely to experimentation and the construction of military prototypes, although some commercial models also were developed. It was actually a "pilot plant" employing 200 aeronautical engineers and more than 2,000 workers.

Wibault's most important undertaking at the arsenal was in the heavy plane field. Heavy planes were France's biggest problem, according to Wibault. Light twin-engined bombers were being turned out in May, 1940, at a rate of 300-500 a month. But practically no 10- to 14-ton bombers were being delivered, although designs were available.

The main drawback, says Wibault, was the engine industry. The best that industry could produce was a 1,000 h. p. engine, but at that production was slow. In spite of this obstacle Wibault was granted 40,000,000 francs [about $1,000,000] by the government to build the Air-Wibault, a 30-ton transport. Pierre Cot, then air minister, had been convinced of the wisdom of this act when Wibault explained that the ship could carry 100 parachutists with full equipment. The Air-Wibault was being built as a com-

(*Continued on page* 94)

Putting the Power in Manpower

by H. R. Ingraham

The Navy is seeing to it that pilots are real he-men.

AMERICAN fighting men died at Pearl Harbor because they lacked the physical strength to climb ropes! Others have perished in the war at sea because they couldn't swim with their clothes on.

In short, while there has been no lack of courage or skill on the part of this country's soldiers and sailors in the war to date, the men who flocked to the colors when war came were physically soft —no match for the lean, hard savages which the Axis powers have infused with their fanatical lust for world domination.

Navy leaders, particularly among the aviators, recognized this deficiency and lost no time setting about finding a remedy. The cure they adopted already has worked wonders and it is no reckless invasion of the realm of prophecy to say that it may make America over, at least from the standpoint of top physical fitness.

To keep the record straight and authoritative, let's hear the indictment of the nation's civilian manpower in the words of husky, handsome Lieut. Cmdr. Thomas J. Hamilton, former Navy football coach and star.

"Our pilots to be inducted into the Naval service in general come from a soft, luxurious, loose-thinking, lazy peacetime life in our homes and schools," Hamilton wrote, in outlining a proposed "toughening" course for Navy fledglings, "and must be prepared physically and mentally to meet and defeat pilots and personnel of our enemies who have been thoroughly trained in a purposeful and wartime physical and mental system for years; in fact, from childhood.

"Our athletic programs have developed mental alertness, agility, initiative and a sporting competitive spirit possibly superior to that of our enemies but there is little question that their youth are stronger, tougher, better physically trained and steeped in a nationalistic and fanatical frame of mind that drives them to carry out their ruthless methods of total warfare."

The need was all too obvious, for if the Navy was to get the 30,000 pilots annually that the strategists decreed, America's cafe cowboys and cookie pushers, as well as the clean-limbed, athletic minority of the high-schools and colleges would have to be put through the wringer. It meant scraping the bottom of the manpower barrel, for remember, the Army wants 75,000 of the same type of youth each year to fly its huge air armada.

Naturally, Hamilton turned to his colleagues in the coaching and physical training fraternity. Approximately 600 of the nation's top-flight coaches and

Lieut. Ed Don George (right), famed wrestling champ, now teaches hand to hand combat.

trainers were brought into the Navy, given commissions and sent to Annapolis in groups of 200 for a month's indoctrination and together they polished off the rough spots in the basic ideas for the toughening program worked out by Hamilton.

At the outset, Hamilton recommended that four pre-flight training centers be established, namely in the east, middle west, south and west, with a capacity of 1,875 students at each. Coming in in increments of 625 monthly at each of the centers for the three-months course, they would train a total of 2,500 monthly or 30,000 a year. Last May 28, the first two centers were commissioned—at the University of North Carolina, Chapel Hill, N.C., and the University of Iowa, Iowa City, Ia. Later, the centers at the University of Georgia, Athens, Ga., and St. Mary's College, Cal., followed.

For a first-hand view of the toughest physical training program in the history of America, let's look in on the setup at Chapel Hill. It's typical.

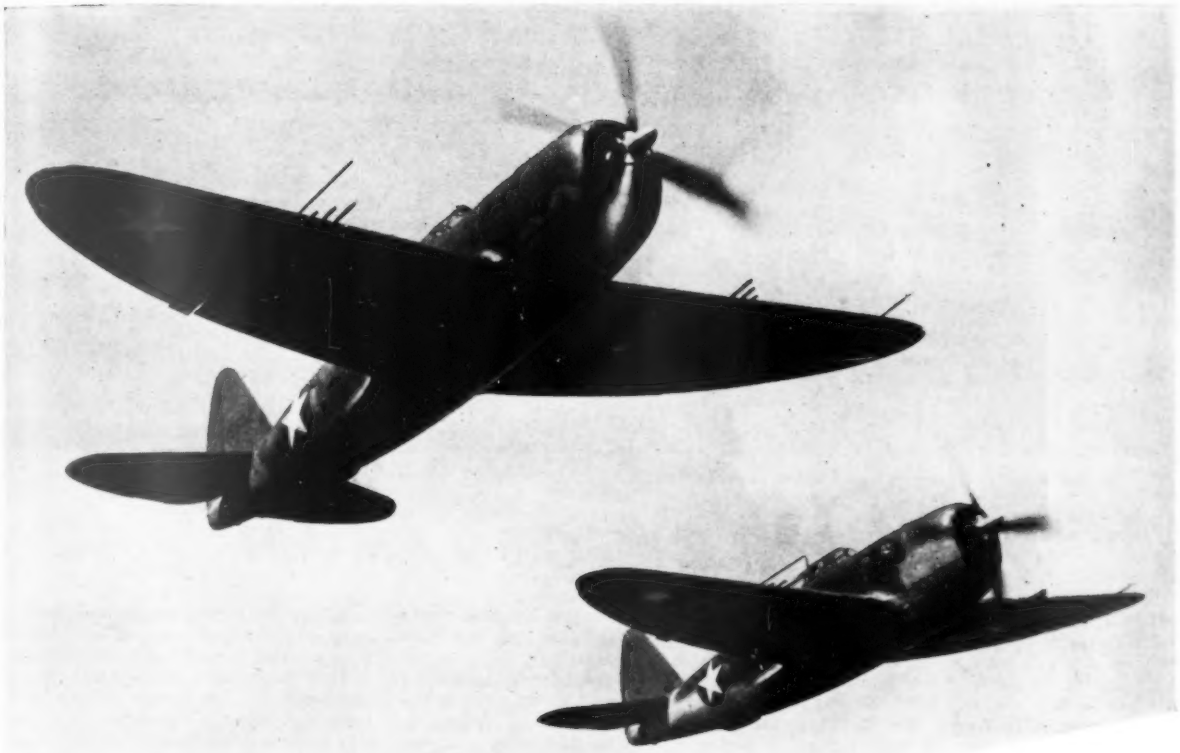
The Navy has taken over about half of the University's facilities although it was not found possible to achieve the completely "monastic life" which Hamilton recommended. There still are co-eds on the campus but the future flyers have no time for them except Saturday afternoon and evening and Sunday afternoon —the only times they get "liberty." The discovery that there was no "liberty" allowed during the other five days of the week came as a shock to at least one of the student flyers. Seeing a cute co-ed seated on the railing of a rustic stone bridge, he wanted to know right away from one of the officers when he could "date."

"No dates," he was told.

"What do you mean, no dates? I don't see any barbed wire."

Hard, gruelling and unremitting work, however, almost completely settle such problems, for when "taps" sounds at 9

(*Continued on page* 108)



Piloting of modern planes, such as these 2,000 h.p. Republic P-47 "Thunderbolts," calls for steady nerves, keen judgment.

AGE AND THE FIGHTER PILOT

By Col. MALCOLM C. GROW
and
Lieut. Col. HARRY G. ARMSTRONG*

Stress of modern combat flying gives a new slant to perennial controversy of old vs. young pilot.

EVER since the end of the first World War one of the favorite pastimes of service pilots has been to argue the relative merits of "young" versus "older" fighter pilots in aerial combat. As furious as these verbal dogfights have been at times, and though they have raged intermittently for the past 20 years, they have never resulted in anything more than a few strained vocal cords and occasionally a slight cooling of friendly relationships between the contestants. Certainly the argument has never been settled as far as the proponents of the two views are concerned.

As might be suspected, the older pilots are invariably on "the older pilot is best" side of the argument and the younger pilots on the opposite side. As might also be expected these arguments have seldom been noted for their use of facts or their brilliant display of logic but have generally been of the "why-you-young-squirt-I-can-lick-the-pants-off-you" variety.

Until recently such banter was more or less of academic moment and indulged in principally as a pastime or for inflating or deflating someone's ego as the case might be. At the present time, however, this question is of considerable military importance. With the fact finally established beyond all doubt that air power is to be the deciding factor in this war, every factor which determines the worth of air power must be evaluated if that air power is to function at its peak.

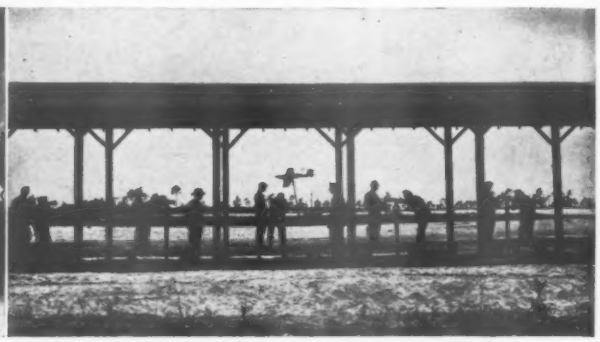
Before discussing the question of the effect of age on success in aerial combat it is first necessary to define what is meant by the terms "young pilot" and "old pilot." They are, of course, not synonymous with the term "young man" and "old man." In war these terms do not even represent the same things that were meant in peacetime. In peacetime, because of the two to four year college requirement for flying cadets, a young pilot was generally considered as one

(*Continued on page* 83)

**Colonel Grow and Lieutenant Colonel Armstrong, Medical Corps, are recognized as two of our leading authorities in aviation medicine. They now are in foreign service.*

AIR SERVICES *Section*

Trainees fire at aerial targets from bomber power turrets.



Firing .50 caliber bullets at speeding model enemy planes.

AAF TRIGGER MAN

THE fair-haired boy of the U. S. Army Air Forces is the aerial gunner. And if you don't happen to think so, ask any pilot or bombardier or navigator who has been in action. He'll tell you, in no uncertain language, how he has to rely on the gunner to defend the bomber as it wades through heavy enemy fighter opposition to drop its lethal load on the target. He'll tell you how many times the skill and daring of the little fellow with the big punch has blasted Jap fighters into pieces during flights over the Pacific.

It was not so very long ago that the bomber was regarded as "helpless" in the air, unless provided with a strong fighter escort. Of course, it had a few machine guns; but try to stick a machine gun out into the slipstream of an airplane moving at 200 m.p.h. plus, and see how accurately you can aim it.

That was before power turrets. Now, thanks to the power turret, a gunner can point his machine guns in any direction, quickly and accurately, and fire them with deadly effect. Where a couple of .30 caliber hand-swivel machine guns were considered the last word before the start of World War II, our *Flying Fortresses* and other heavy bombers carry two .50 caliber machine guns per turret; and those turrets are all over the airplane, ready to spurt forth a withering fire in any direction. Another pair in the tail—appropriately called the "stinger"—is bad medicine for any enemy fighter that dares to venture within range of its murderous blast.

Sheathed with heavy armor plate and able to move his guns up or down or from side to side with, literally, a mere twist of the wrist, the aerial gunner can sit back and cut enemy airplanes in two, just about as fast as they come.

Before he is allowed to go aloft and try his hand at making nothing out of *Zeros*, a gunner has been through a stiff five-week course of training at one of the Army Air Forces flexible gunnery schools, which are located at Harlingen, Tex., Las Vegas, Nev., and Panama City, Fla.

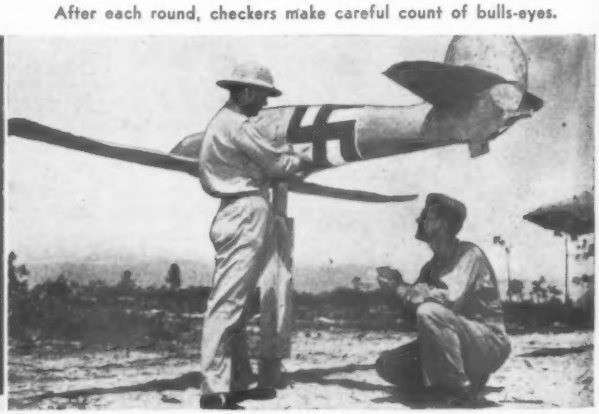
From one standpoint, this course is one grand and glorious round of shooting galleries. The trainee fires every kind of gun imaginable, from miniature "B-B" tommy guns and .22 caliber rifles, to shotguns and .30 and .50 caliber machine guns. He fires from stationary and moving positions on the ground; he fires from airplanes and moving vehicles; he fires at still targets and rapidly-moving ones, both on the ground and in the air. The course has been described as a "gun-lover's paradise"; certainly, there isn't much about guns that he doesn't know, by the time his course is ended.

But the flexible gunnery school course is a lot of hard work, too. The trainee must learn how to assemble his guns blindfolded; he must know how to keep them in tiptop condition and repair them. He learns how to estimate distance and speed. He learns the silhouettes of both friendly and enemy aircraft so that he can recognize them instantly. He learns theory of ballistics and gunnery and a host of other subjects that will come in mighty handy when he finds himself up in the air among a flock of enemy fighters.

Even after he finishes his course, however, and is proudly wearing his wings with the grade of a sergeant on flying status, he is not ready for combat. He goes to an "operational training" organization for further instruction. Here he learns to work smoothly with the men who will be his fellow crew members

Gunner draws a bead on a target plane moving along horizon.

After each round, checkers make careful count of bulls-eyes.



and gets to know the ins and outs of his airplane by heart. When, finally, he and his crew mates are a perfectly functioning combat team, they are sent on to a tactical unit. When they meet the Japs or the Nazis for the first time, each man will know what to do and the gunner will justify the confidence of his mates.

Scrappy, lion-hearted, and preferably not too large, the gunner is the trigger man of the AAF. He's got a tough job, a job that requires lots of hardihood and dash. But he goes into action with the best gunnery training, the best guns and the best airplanes in the world as his allies. He's got just one idea, and that's to keep the enemy airplanes falling. What's more, he can do it, too!

Technical Trainees

THE time that any airplane spends in the air is directly proportionate to the time that is spent on it while it is on the ground. The bigger and more complex any airplane is—and this applies particularly to modern military aircraft—the more its efficiency depends on the skill of the ground personnel. Every flyer knows this, and traditionally strives to get the best mechanics at a base assigned to him, even more than he tries to get the best airplane. He knows that, if he has good mechanics for his ship, he can't help but have a good airplane.

Realizing the truth of the statement that no air force can be better than its ground personnel, the U. S. Army Air Forces are now going all-out in the most ambitious technician-procurement program ever attempted. For every flyer there must be 10 men on the ground; skilled men such as radio experts, engine mechanics, airplane mechanics, instrument men and armorers, to name but a few of the dozens of categories of skilled workmen the Air Forces need *now*.

This huge training program, which will add thousands of men to the Army Air Forces in the near future, is the responsibility of the Army Air Forces Technical Training Command, headed by Maj. Gen. Walter R. Weaver, with headquarters at Knollwood, N. C. From every part of America, men skilled in technical subjects are flocking to training centers.

Many of these men will have a chance to work with equipment that is the last word, equipment so new and secret that they would never have a chance to get their hands on it outside of the armed forces. And they know that after the war, they will be an exclusive and highly sought-after coterie of experts on such scientific developments of the future as television, air navigation, instrument design and airplane maintenance. In the meantime, they will enjoy good ratings (the Air Forces does *not* want men who won't be eligible for ratings), plus the opportunity to fly, plus the genuine enjoyment of membership in the AAF, the up-and-comingest outfit on earth.

And as if that weren't enough, they will have the enjoyment of living in the atmosphere of flying, and enjoy the thrill that never goes away, once it gets into the blood, of knowing airplanes and airmen and aviation—from the ground up!

Lieut. Robert B. Smith

Lieut. Col. A. W. Smith

Lieut. Weldon H. Smith

FAMILY AFFAIR

FOR at least two pilots of Army *Flying Fortresses*, the Battle of Midway was a family affair. Piloting one of the big ships that did the reconnaissance work and photography after the raid was over were Lieut. Robert B. Smith and Lieut. Weldon Smith, brothers who were pilot and co-pilot, respectively.

Although they didn't get in the actual fighting, and were not bothered by enemy fighters, they spent several hectic days at the mid-Pacific outpost gathering valuable data for the Army Air Forces.

Anxiously following their work and the Battle of Midway was their father back at the home base. He is Lieut. Col. A. W. Smith, flight surgeon of the Air Force of which they are a part!

"Yank" Now Sold in U.S.A.

YANK, the Army's official newspaper for service personnel, started out as an overseas publication exclusively, then a limited number of copies were made available for distribution within the continental limits of the United States, and now has gone the whole way toward creation of a paying readership in this country. Subscriptions are now offered at 75c per month to members of the armed forces throughout the United States, and single copies will be sold through domestic PX's, service clubs and other military agencies.

Reading Matter Wanted

SUPPLIES of current and popular magazines will soon be heading toward U. S. Army personnel stationed throughout the world, to keep Uncle Sam's doughboys happy. An order has been placed through the quartermaster general to buy the publications on a unit-per-company basis, and they will be mailed periodically to various embarkation points.

Correspondence Course

ARMY AIR FORCES personnel, along with other members of our armed forces, are now eligible for individual instruction in a variety of subjects through correspondence courses, set up through the Army Institute. WD Circular 232, now being distributed to the fields, lists the available courses, some of which are supplied by co-operating colleges and universities.

Reexamination Permitted

APPLICANTS for aviation cadet training who have previously been rejected because of failure to pass the mental qualification examination may be reexamined, provided that a period of one month has elapsed since the previous test and that the applicant takes a different form of examination than that which he failed.

Mission Complete

PICTURED below is the end of an exploit which won the DFC for Lieut. Joseph A. Jaap, USN, and letters of commendation for his crew members of a Martin PBM-1 patrol bomber. The big bomber is shown discharging at Bermuda nine survivors of a torpedoed British tanker, picked up hundreds of miles at sea.

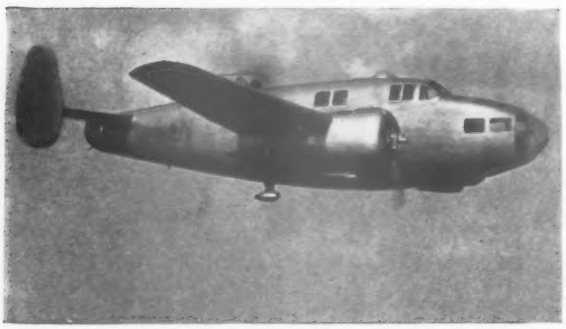
Survivors of torpedoed tanker reach port.

In order to effect the rescue, Lieut. Jaap landed the gull-winged Martin in a sea of towering 12-foot waves, took aboard the survivors and made a successful take-off. Presentation of the honors to Lieutenant Jaap and his men was made by Rear Adm. Jules James, commandant of the Naval operating base at Bermuda, who said, in part:

"Your action in landing hundreds of miles from land in a rough sea and in the presence of the enemy in order that the brave British seamen you rescued from their sinking raft might continue to fight, will be throughout the war an inspiration to this command and to those of your countrymen who learn of your splendid performance."

Before this "Airacobra" left Selfridge Field, Mich., for another base recently, pilots and ground crews chalked messages to Yankee warriors on its fuselage. The pilot was Lieut. John Kassus of El Dorado, Ark.

HAVE YOU SEEN?

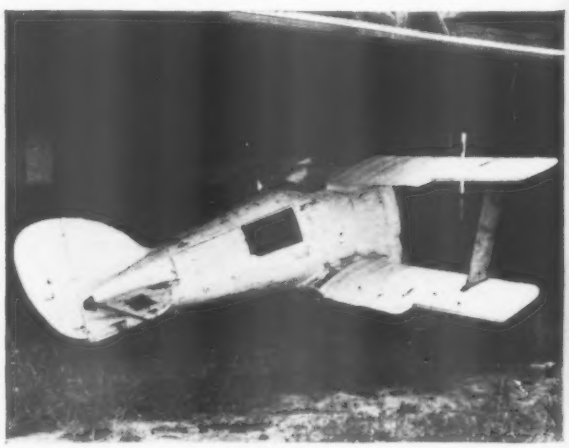


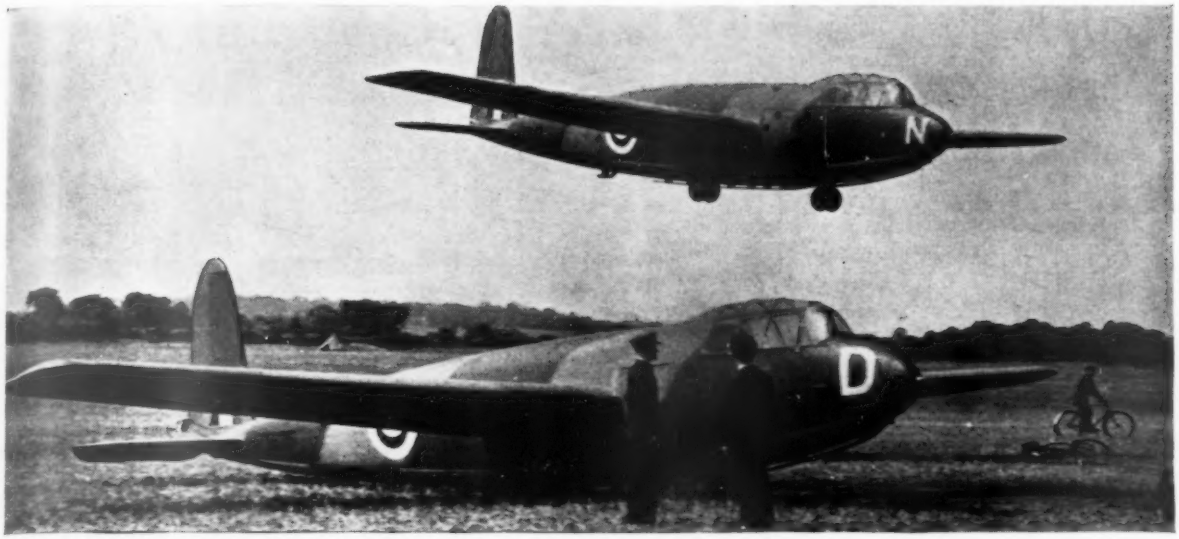
Built almost entirely of Duramold, Army's new Fairchild AT-13 is bomber trainer. It has tricycle gear, span is 52 ft. 6 in.

Newest Navy patrol bomber is Boeing "Sea Ranger" (PBB). In four-engined class, it has two most powerful engines in U. S.

Constance Walker, 23, is an expert tool designer at Douglas. Daughter of an engineer, she is studying nights for a degree.

A "mystery plane" found recently at an abandoned California airport, this biplane has plywood fuselage, 60 h.p. Lawrence.





First British troop-carrying glider is this four-wheeled mid-wing monoplane, called the "Hotspur." Glider pilots are from British army, are trained to fly by RAF. Air force planes serve as towers.

An improvement over the AT-8, the Cessna AT-17 navigational trainer now is used by Army. Engines are two 225 h.p. Jacobs.

Vultee P-66, used in small numbers by U. S. Army, also is in Chinese air force. Prototype had 10 .30 caliber machine guns.

Two new types of Army training gliders are the Laister-Kauffman XTG-4 (above) and Schweizer XTG-3. Both carry two pilots.

This is the tail gunner's post in Boeing B-17E. Gunner in inset aims .50 caliber guns through bulletproof glass panel.

COMPUTATION BY NOMOGRAMS

by
RAOUL J. HOFFMAN

IT is often necessary, for estimating purposes, to make a large number of calculations with the same formula. A slide rule is very convenient for ready use if carefully operated. However, to minimize the chance of error, usually by a misplaced decimal point, graphical computations with the aid of alignment charts—or "nomograms"—are great time-savers.

Nomograms are generally used when the degree of accuracy of the results is not expected to be too close. This is the case in preliminary designs. Also the size of the nomogram has a great deal to do with its limitations.

There are nomograms of different construction principles. In the following, however, only the construction of alignment charts having parallel scales will be shown.

Nomograms for formulas containing two variables are constructed by laying out the values of one variable on one side of the line and the values of the other variable on the other side. A single-line nomogram is shown in Section 1 for finding the area of a circle if the diameter is given (or vice versa). Any convenient scale can be used.

This simplest form of graphical chart is frequently used for conversion of a system of units of the same character to units of another system. For instance, the temperature measured in centigrades to that of the Fahrenheit scale.

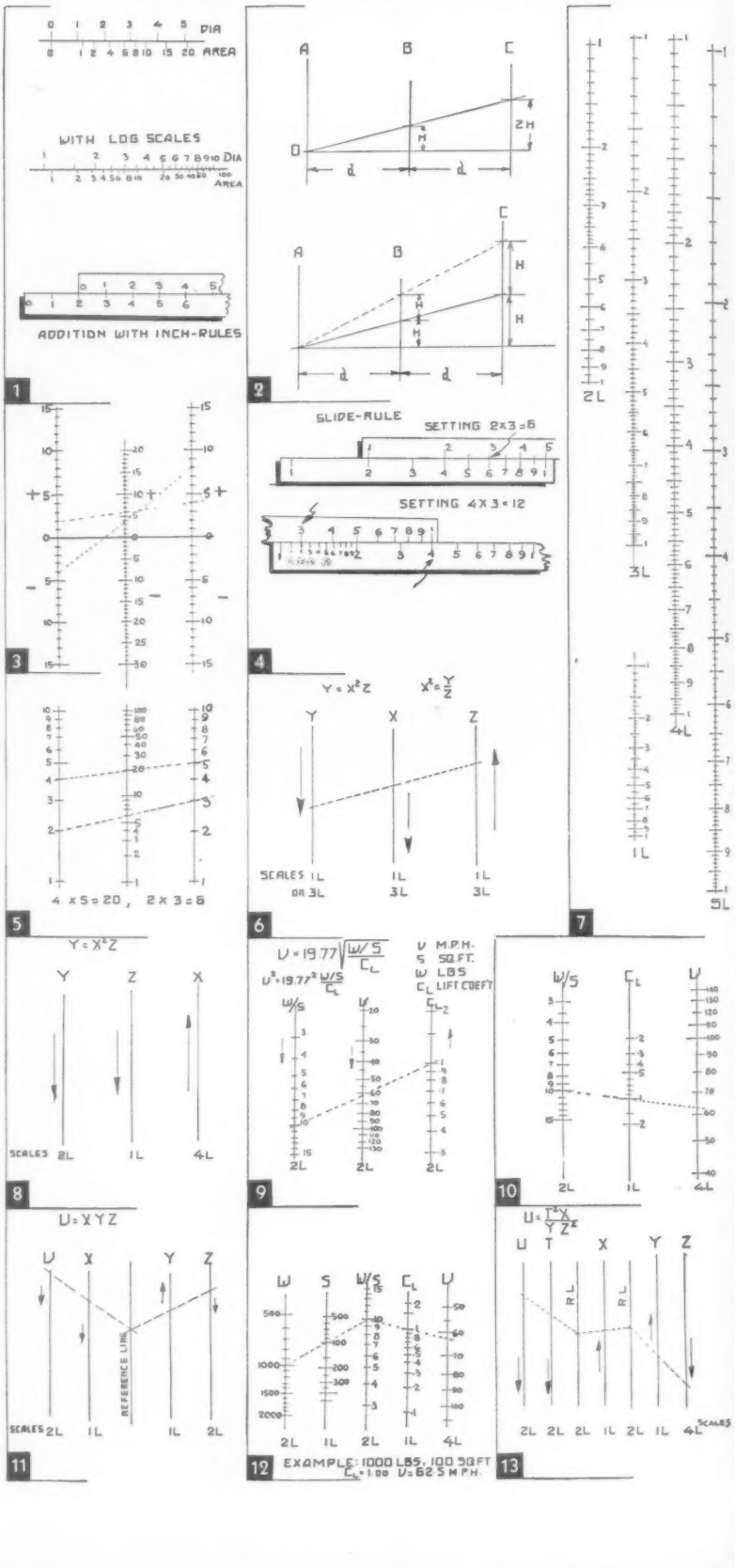
Simple additions may be done by the use of two scales having inch divisions. Connect the zero point with the first figure and read at the second figure the sum on the lower scale as sketched in the bottom layout in Section 1. This process is basic for slide rule operations.

Most formulas generally contain three or four variables. The diagrams shown in Section 2 give the workings of many nomograms. Three equidistant parallel lines—A, B and C—are drawn. A line is drawn across the three lines from point O. Length H is measured on the B line and connected with O. This line will intersect the C line at twice the length or 2H. Now if the C line is graduated into double length divisions, then any number of units added to the C scale will add the same number of units on the B scale, as shown in the lower diagram in Section 2.

This simple form of adding or subtracting is applied to the construction of the nomogram in Section 3. Three equidistant lines have the same divisions on the outer lines and twice as many graduations on the center line. The length of the scales limits the range of computation. Two examples are indicated by dotted lines. Two plus 4 and 8 minus 4. The results are found on the center

(*Continued on page 102*)

TYPICAL EXAMPLES OF ALIGNMENT CHARTS.



Preventative Maintenance

Careful, periodic overhauls—whether or not they are needed at the moment—will keep this Stinson "Reliant" flying for years.

Years of experience as an airplane mechanic and, more recently, as a maintenance supervisor for the CPTP, taught the author the value of proper aircraft and engine maintenance not only as a safeguard against accident, but as a conservation move particularly valuable during these days of priorities and definite bans on parts for private aircraft not directly identified with the nation's war effort.

Mr. Curry started flying in 1928, and organized his first repair station two years later. His was one of the first repair stations in the country to have Federal approval for all eight classes of aircraft and engine repairs. He managed his own business until 1940, at which time he was appointed a maintenance supervisor for the CPTP.—Ed.

by R. J. CURRY

The best investment a plane owner can make today is in maintenance. Wartime operation of civil aircraft is doing much to establish sound operations policies for private flyers to follow in years to come.

SINCE the all-out declaration of war, the conservation of airplane parts is a necessity. The fellow with a couple of extra tires and a spare engine is a prince in his own right.

If you are one of the unfortunate fellows who can't rank as a prince, and you are worrying about keeping those ships in the air, you had better take stock of your maintenance facilities. In order to make your planes last as long as possible you are going to have to do more than inspect them for wear. If you want to get the maximum hours out of them you are going to have to inspect them for the *causes* of wear.

Today in aviation circles preventative maintenance has taken its place at the head of all maintenance problems. Preventative maintenance has been described as that art of investigating accidents before they happen.

This job of finding things that are weak and correcting them before they have had a chance to fail has probably saved every operator on the CPTP thousands of dollars and, what is more important, has probably saved a number of pilots' and students' lives.

Until the advent of the CPTP maintenance supervisors, the job of maintenance was an individual problem with each mechanic. When a ship was brought in for an inspection the mechanic checked everything that his experience told him would give trouble and then he hunted for trouble in other places, but he had only his own limited experience to go on and as a result he missed things that could give trouble at a future date, not because of any wilful neglect or carelessness but because he had not heard that that particular part was giving trouble on other ships.

If he did find some part that was failing the chances were that he got in touch with someone at the factory, told his

(*Continued on page 87*)

I LEARNED ABOUT FLYING FROM THAT!—NO. 39

by JOHN P. GATY

Vice President, Beech Aircraft Corporation.

Caught in a canyon, with the ceiling closing down behind and rain ahead, taught this pilot to respect the weather.

IN APRIL, 1938, I was flying an F17D Beechcraft biplane from Sacramento to Tacoma, Wash. The airplane's radio had stopped working before I arrived at Sacramento and it had been fixed by a radio electrician at the Sacramento Airport. About 150 miles north of Sacramento, the radio quit working again and emitted no sound thereafter.

Because the weather was reasonably good, the failure of the radio was only a minor inconvenience and a landing was made at Medford, Ore., about noon. At the pass, just south of Medford, the cloud ceiling closely approached the ground but there was enough room to squeeze through the pass with a few hundred feet to spare under the ceiling, and the open valley could be seen ahead over the top of the divide. As this pass has an altitude of about 4,000 feet, it was obvious that the altitude of the cloud ceiling was approximately 4,500 feet at this point, and it appeared to be unbroken.

John P. Gaty

Inquiry at Medford revealed the fact that no technician was available to repair the radio and an examination of the equipment disclosed nothing that could be fixed without test equipment.

The question then arose as to whether to wait for clear weather to continue the flight or to go on without a radio in spite of the fact that there was an unbroken overcast which extended considerably below the tops of a great many of the mountains north of Medford. Without a radio it would have been foolhardy to go up on top of the solid overcast, with mountains underneath. Upon discussing the matter with the operator of the airport at Medford, it was found that the railroad running north through Grant's Pass to Eugene, Ore., passed through a valley which varied from 1,500 feet downward.

An examination of the airways chart indicated that after passing through a tunnel at Wolf Creek, the railroad ran downhill alongside a creek and that the altitude of the railroad varied between 1,430 feet and 706 feet, decreasing in altitude as it proceeded northward. A mental calculation indicated that a ceiling of approximately 3,000 feet should be usable under the clouds, if the cloud ceiling stayed where it was when it was last checked in the pass south of Medford. The problem therefore seemed perfectly simple, and after gassing up the airplane a take-off was made for Tacoma.

After take-off, an altitude of about 3,000 feet above sea level was attained and this was maintained while following the railroad west into Grant's Pass and north past Merlin. The ceiling then started to decrease somewhat and forced operation at a lower altitude. The local divide was passed at Wolf Creek, where the railroad goes through a tunnel, and a mile or two beyond at Glendale, there still was approximately a 1,500-foot clearance between the ground and the cloud ceiling. But the mountains were sticking up in the overcast.

Inasmuch as the map indicated that the stream alongside the railroad was downhill all the way to the open valley beginning at Riddle, about 35 miles north of Glendale by way of the railroad, and because Riddle was 700 feet lower than Glendale, it was decided that it was perfectly safe to continue the flight. Therefore, the narrow valley was entered.

It was not long after entering this narrow valley that difficulties began to develop. The ceiling came down rapidly and forced the airplane lower and lower. This should have been a warning, but at the time the last possible place to turn

(*Continued on page* 104)

Night Vision

"POPEYE THE SAILOR" has the right idea. You must eat spinach to fight, particularly if you're a night aviation pilot. Diet ranks high among the dozen commandments for night vision compiled by the U. S. Navy's Bureau of Medicine and Surgery.

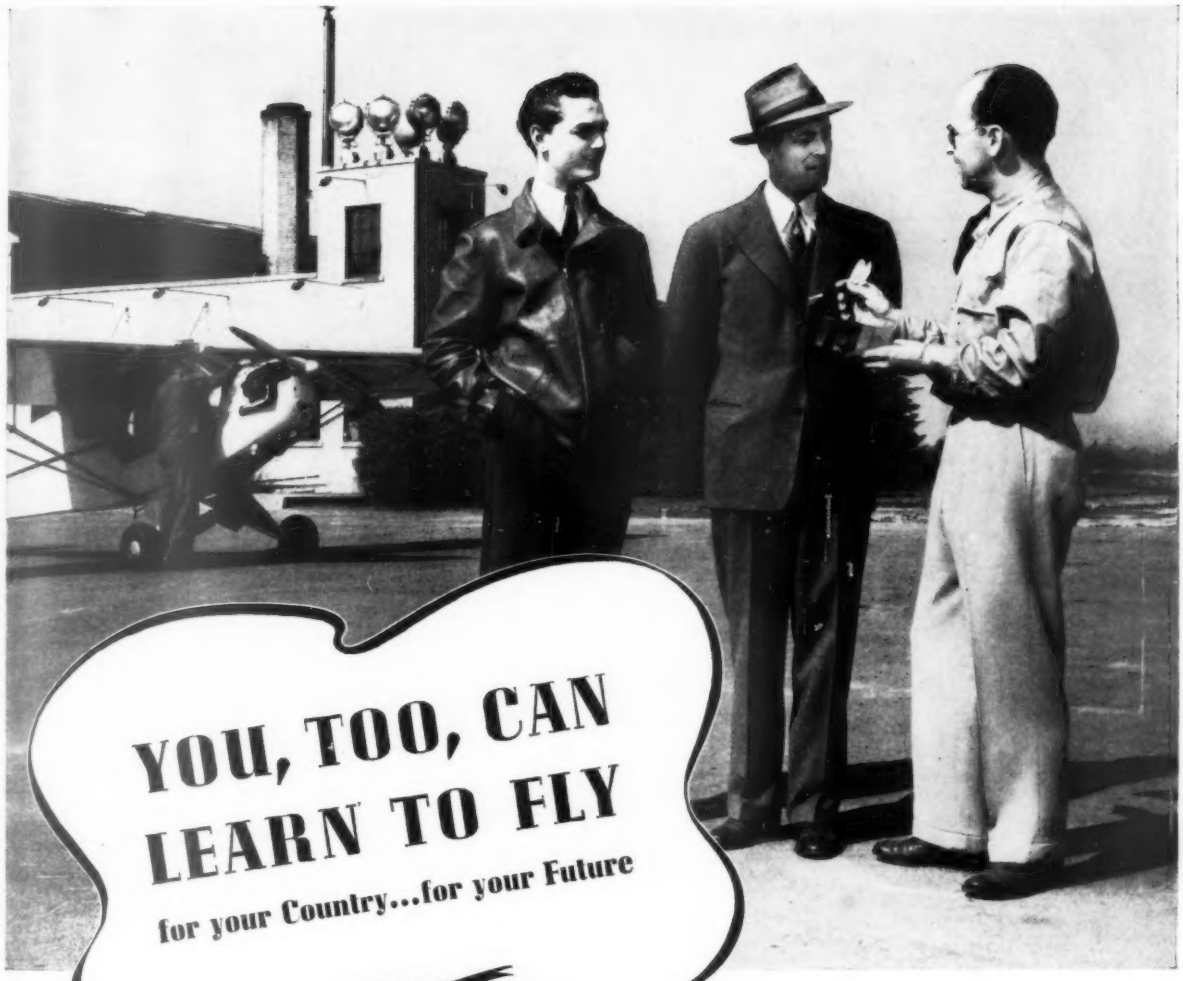
After exhaustive research on this newest of aviation battle techniques, the Navy holds no brief with widely publicized theories that "drugs" and "large vitamin doses" are essential to good night sight. Rather it prescribes the following training rules with the pertinent observation that it is not enough to know these rules and practice them occasionally, rather "One must live them constantly if one is to live constantly":—

1. Do not attempt night flying duties until your eyes have been prepared thoroughly for use in the dark.
2. Practice blindfold drills until you know your surroundings by touch.
3. Use dim red light for instrument lighting. Do not stare at lighted instruments.
4. Practice use of the corners of the eyes. Night targets are seen better by not looking directly at them.
5. Move the eyes frequently; practice systematic scanning; be alert for moving objects.
6. Know the tactical value of low light contrast in night missions.
7. Keep windshield and goggles spotless and unscratched.
8. Use night binoculars whenever possible.
9. Follow strict rules of diet and rest.
10. Follow instructions in use of oxygen. Be overcautious at night, not overconfident.
11. Don't "break training." One minute of light will destroy an hour of preparation.

A primary requisite for night vision is to allow dark adaptation to take place. The second is to preserve this condition when it has taken place. Because the rods of the eyes are not sensitive to red light, that red light can be used to produce and maintain dark adaptation. One method is to use red lamps of specific intensity and wave lengths; the other to use normal light with specially treated red goggles. The Polaroid dark-adaptor goggles, developed under the direction of Lieut. Comm. Leon Carson (MC), USN, are revolutionizing night vision procedure. Until now, personnel assigned to night duty have had to start out blind, without dark-adaptation, or to pre-condition their eyes by spending from 20 to 30 minutes in a dark room, unable to see. They can now wear Polaroid dark-adaptors a half-hour before going on duty, go about preparatory work under full illumination, and can report directly for active missions with excellent night vision, so nearly adjusted that only 2½ minutes of full darkness are needed to achieve *maximum* night vision.

Blindfold drills are valuable training for conducting night duties without lights.

(*Continued on page* 110)



YOU, TOO, CAN LEARN TO FLY

for your Country...for your Future

TAKE-OFF on a career in aviation . . . to help your country now and open unlimited opportunities for your future! Follow the lead of thousands of pilots now serving America in its great fight for democracy. Learn to fly, as they did, in the famous Piper Cub Trainer... the plane flown in the Civilian Pilot Training Program more than all other makes of planes combined.

Remember, pilots aren't born—they are trained—and you don't have to be a superman or endowed with some mystical skill to fly a dependable, easy-to-fly Piper Cub. Whether you're sixteen or sixty, if you are in normal health and possess normal judgment, YOU can learn to fly with as little as 8 hours of dual instruction!

Never was it more advantageous for you to learn to fly. Today America needs pilots to win the war. Get the jump on the other fellows . . . learn to fly now and assure yourself a top position in military aviation.

In the future a huge aviation industry will offer great opportunities to pilots of all ages. The knowledge of flying can help you materially in your business activities . . . and flying saves you time, gasoline and tires.

Visit your Piper Cub Dealer . . . he will be glad to give you a flight demonstration and tell you how you can become a pilot now.

FREE BOOK ON HOW TO FLY. Send today for your complimentary copy of the easy-to-understand book "You, Too, Can Fly!" And, if you want, in addition, one of the beautifully illustrated full-color Piper catalogs, enclose 10c in stamps or coins for postage-handling. Piper Aircraft Corporation, Dept. PA102, Lock Haven, Penna., U. S. A.

PIPER POINTS THE WAY TO WINGS FOR ALL AMERICA

The Billy Mitchell Case

(*Continued from page* 43)

upon the military service and all crimes and offenses not capital, of which persons subject to military law may be guilty, shall be taken cognizance of by a general or special or summary court-martial, according to the nature and degree of the offense, and punished at the discretion of the court."

Mitchell asserted that the department's formal charges against him evaded the issue and would prevent the disclosure at his trial of the truth of his charges concerning air administration by the Army and the Navy. He had refused, meanwhile, to appear before the *Shenandoah* Board of Inquiry, but had testified before the Morrow Board, presenting his views with considerable restraint and quoting at length from his "Winged Defense" to explain his ideas.

Another witness before the Morrow Board, Admiral Sims, lent support to Mitchell's position with the assertion that the Navy had no air policy and no real air organization. The policy of the Navy, said he, should be command of the air, not a "well-balanced fleet," which he termed a meaningless phrase.

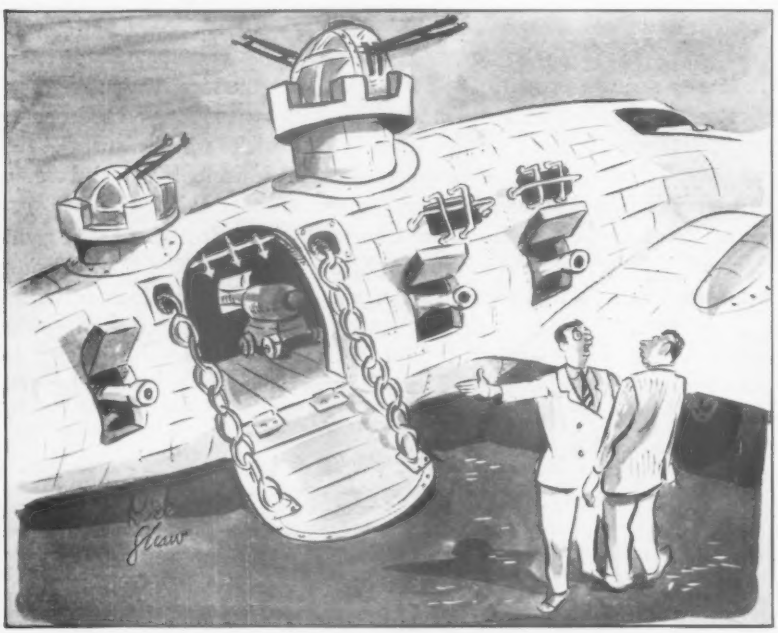
However, Sims disagreed with Mitchell as to the desirability of a unified air arm. Mitchell had done well to bring conditions in the air services to public attention, the admiral thought, but was wrong in proposing to take aviation away from the Navy—Naval air forces should train with the fleet. This was a significant disagreement by a friend of Mitchell and to this day no Naval officer, air or otherwise, of any high rank has approved the idea of shifting Naval aeronautics to a separate and independent air arm.

With the trial drawing near, the names of the members of the court were announced, the most imposing collection of military rank ever assembled in Washington for a court-martial.

President of the court was Maj. Gen. Charles P. Summerall, commander of the Second Corps Area. With him were to sit five major generals—Robert L. Howse of the Fifth Corps Area; Fred W. Sladen, superintendent of West Point; Douglas MacArthur, Third Corps Area; William S. Graves, Sixth Corps Area, and Benjamin A. Poore, Seventh Corps Area; and six brigadier generals—Albert J. Bowley, commandant, Fort Bragg; Edward L. King, commandant, General Service Schools, Fort Leavenworth; Frank R. McCoy, commanding Third Infantry Brigade, Fort Sam Houston; Edwin B. Winans, Fort Clark; George LeR. Irwin, commanding Fort Sill; and Ewing E. Booth, commandant of the Cavalry School, Fort Riley.

Col. Blanton Winship, a future governor of Puerto Rico, was law officer of the court and the prosecutors were Col. Sherman Moreland, the Judge Advocate of the Fifth Corps Area; and Lieut. Col. Joseph I. McMullen, of the Judge Advocate General's office. Several others were to join them during the trial, notably Maj. Allen W. Gullion, now the Provost Marshal General of the Army.

Col. Herbert A. White, of the Judge Advocate General's Department, was assigned as defense counsel, but Mitchell's chief counsel was a civilian, Rep. Frank R. Reid of Illinois, who announced that the constitutional guarantee of freedom of speech would be the colonel's defense.



"... We designed it to compete with the 'Flying Fortress'."

As the trial opened in a small room of a War Department warehouse which stood at Peace Monument Circle at the foot of Capitol Hill and has long since been demolished, Mitchell, arriving smartly dressed and jauntily swinging a Malacca swagger stick, set the pace by challenging General Summerall's presence on the court, charging him with personal hostility.

The colonel recalled that, as Assistant Chief of the Air Service, he had inspected and criticized strongly Summerall's air administration in Hawaii. The general, flushed and angry, told the other members of the court that he had been unaware until that moment that Mitchell's official report was a matter of personal dislike and he gave up his seat on the court without waiting for a ruling on Mitchell's challenge.

General Bowley also left the court on Mitchell's charge of personal prejudice and bias, and Sladen was excused on the single summary challenge allowed the defendant. Reduced to nine members, the court sat with General Howse as president.

Mitchell admitted formally that newspaper accounts of his statements in Texas were accurate and the court surprised everyone—including Mitchell and his counsel—by deciding that the colonel could call as many witnesses as he wished in an attempt to prove his statements against the departments, although technically these were not within the scope of the Army's insubordination charges against him.

For seven weeks the trial was a nationwide sensation, as witness after witness built up a huge record of testimony. Crowds pushed and fought for the limited seats in the courtroom and had to be scolded almost daily by General Howse for their noisy behavior.

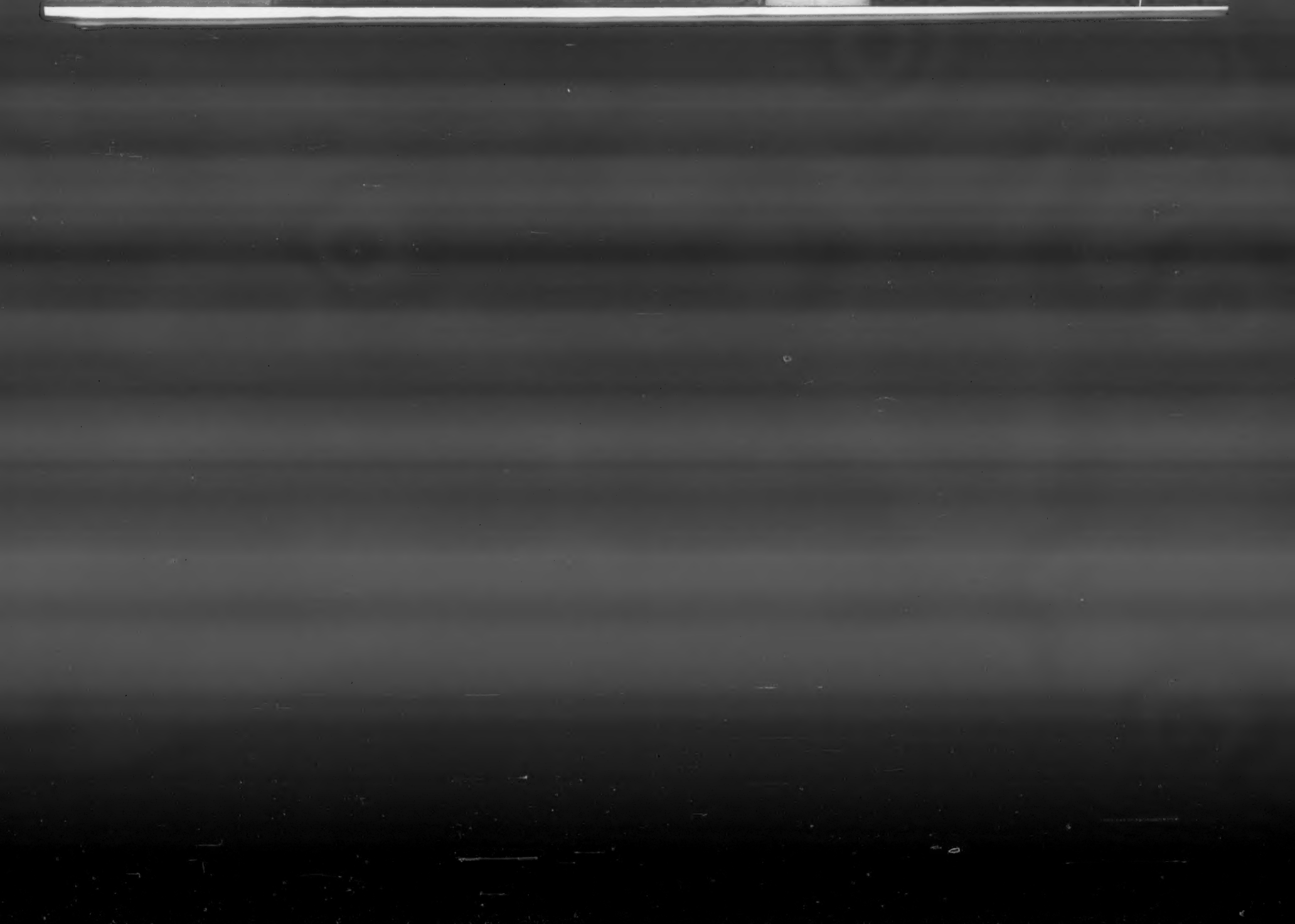
The widow of Commander Lansdowne appeared to testify that her husband had started on his fatal flight after a protest that was "as strong as he could make it," and supported Mr. Reid's charge that a Navy officer had attempted to persuade her to give perjured testimony before the *Shenandoah* board of inquiry.

Air officers followed each other in rapid succession on the stand, many of them still active and high in the command of the Army Air Forces. Among them were Maj. Carl Spaatz, Capt. Robert Olds, Maj. H. H. Arnold, Maj. Gerald C. Brant and Maj. H. A. Dargue.

Their testimony supported Mitchell's contention that the Air Service was getting less attention than it deserved, but hardly added up to a conspiracy by the General Staff to stifle aeronautical development and stunt the careers of air officers.

Spaatz reported that department policy was such as to retard the organization and development of the air service. There had been no bombing operations for two years, he said, and most of the Army's planes were obsolete, obsolescent or of little serviceable use.

The fatal crash of Maj. Sheldon H. Wheeler's plane in Hawaii was blamed by Olds on a staff economy order that Air Service officers had to stop their forced



I'LL BE SEEING YUH!

Neither bombast, nor pilot's "hunch" are in this simple statement. ☆ ☆ ☆ When a task force pilot takes off in an American built plane he's confident that he'll be back — safe and sound. He knows his training is the finest on the earth, his ship the best in the air, and he looks forward eagerly to each new flight as another prized entry in his log book. ☆ ☆ ☆ ☆ ☆ Front page headlines from all over the world emphasize the job our pilots are doing up the line — and those of us at home who supply planes or parts cannot relax our efforts for a single instant. ☆ ☆ ☆ Here at Aeronca we stress our efforts as — solely "First and Finest" for the men of the United States Armed Forces. ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

Aeronca Aircraft Corporation, Middletown, Ohio.

AERONCA

FIRST FINEST

The Aeronca Victory Award

The Aeronca Aircraft Corporation pledges its entire resources of equipment and experience to produce only the finest in material and manufacture for the men who are privileged to fly for their country. ☆ ☆ ☆ ☆ The — Aeronca Victory Awards — presented to employees for skill that develops better products or creates time-saving operations — are our dedication of an "all out" pledge to win the war in the shortest space of time.

AERONCA

landings, which were costing too much money in the shape of wrecked planes. Olds said Wheeler died in the flaming wreckage of his plane when his efforts to bring it down on Luke Field after his engine stalled just after a take-off were unsuccessful, and the craft went into a spin.

Maneuvers in Hawaii had been hampered, said Brant, by the lack of a unified command. Walsh told the court that War Department procrastination had cost the United States control of Central and South American air mail and commercial lines in areas vital to defense of the Panama Canal.

The Army's planes were described as out of date and dangerous. Mitchell termed them "flying coffins." Admiral Sims was a witness, charging that the Navy was assigning "ignorant and uneducated officers" to important posts, and that its nearest approach to an air policy was "bumping along from day to day."

In a refutation of Mrs. Lansdowne's testimony Adm. Edward W. Eberle, Chief of Naval Operations, told the court that Navy Department policy gave dirigible commanders unlimited discretion in carrying out orders. Lansdowne could have canceled the trip of the *Shenandoah* at any time he thought weather conditions were unfavorable, and was aware of that fact, Eberle said.

On the stand himself, Mitchell said that his recommendations as Assistant Chief of the Air Service brought little or no results. Asked by members of the court if his "almost treasonable" charge meant that he thought the system, rather than certain individuals, failed to carry out a trust properly, Mitchell said that was his meaning.

As an instance of "criminal negligence" he cited retention for economy of old World War type De Havilland planes, although of somewhat improved models, as the standard Army plane, despite their dangerous instability and the difficulty of handling them safely. It was these planes which Mitchell called "flying coffins."

In support of the colonel's charge that air officers of both services were hesitant to speak freely on military aviation because they feared indirect disciplinary action, Representative Perkins testified that at least three Navy flyers had expressed this fear to him and that one of them said "it's a long way to Guam."

But the trial was nearing an end, with Colonel Winship warning Major Gullion not to go outside the charges and specifications when Gullion planned an attack on Mitchell's veracity. Bitter wrangling marked the development of this tack by Gullion, who charged Mitchell with plagiarism in Winged Defense but was told by the court that the book had no bearing on the trial.

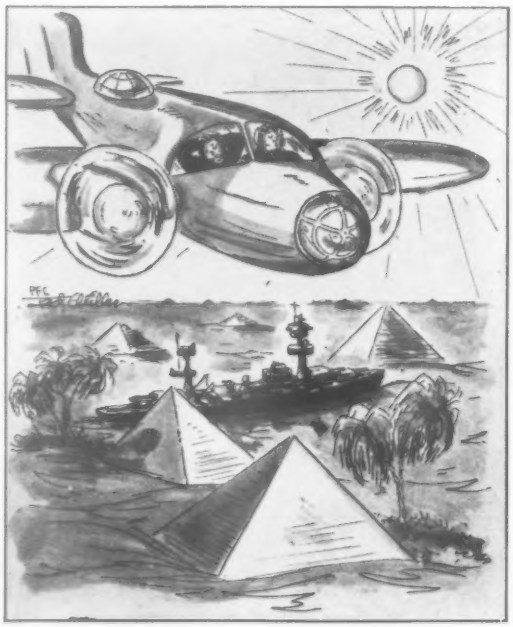
Gullion scored smartly against the doughty colonel, however, when he asked him if he were not the same Mitchell who, in 1913, had told a Congressional committee he opposed a separate air force and that disgruntled individuals should not make statements which would tend to disorganize the service.

The crowd roared with laughter and even Mitchell smiled as the prosecutor pulled that pre-war statement out of the record.

"I was a member of the General Staff then," was his reply, "and I never made a worse statement."

The testimony completed, Mitchell refused to allow Reid to present a closing argument which "could serve no useful purpose," and instead made a brief statement himself.

"My trial before this court-martial," he said, "is the culmination of the efforts of the General Staff of the Army and the General Board of the Navy to deprecate the value of air power and keep it in an auxiliary position, which absolutely com-



"B-4 reporting enemy ship driven out of the Mediterranean Sea. That is all . . ."

promises our whole system of defense."

Summing up for the prosecution, Gullion described Mitchell as "a good flyer, a fair rider, a good shot, flamboyant, self-advertising, widely imaginative, destructive, never constructive except in wild non-feasible schemes and never overly careful as to the ethics of his methods."

The trial was over and the court of nine general officers found Col. William Lendrum Mitchell guilty on all counts of actions to the prejudice of good order and military discipline and in a way to bring discredit upon the military service, in a manner insubordinate and highly contemptuous to the War Department and with intent to discredit the administration of the Navy Department. He was sentenced to a five-year suspension from rank and command, pay and allowances, the court commenting that it had been lenient because of his distinguished war record.

President Coolidge approved the decision, but restored Mitchell's allowances and half his pay for the period of the sentence so that the effect of the punishment would not be extended to the colonel's dependents.

"The theory of government," said Coolidge, "implies that every official, so long as he retains office, shall deport himself with respect toward his superiors. This is especially true of those in the military service. Unless this rule is applied, there could be no discipline in the Army and Navy, without which those two forces would not only be without value as a means of defense, but would become actually a menace to society. Discipline is the whole basis of military training."

This was on January 25, 1926, and two days later Mitchell submitted his resignation from the Army, to be effective February 1. The resignation was accepted and, after nearly 30 years, William Lendrum Mitchell was a civilian again.

He was not "cashiered." He could have waited out the term of his suspension and returned to active duty with his rank of colonel. The court described the punishment as lenient. Mitchell had produced testimony to support his ideas about air power, but had failed utterly to prove that the War and Navy Departments were criminally negligent and almost treasonable, or his assertions that on the whole the General Staff was made up of men who were either ignorant and incompetent, or deliberate and malicious liars. The decision to resign was his decision, not the Army's.

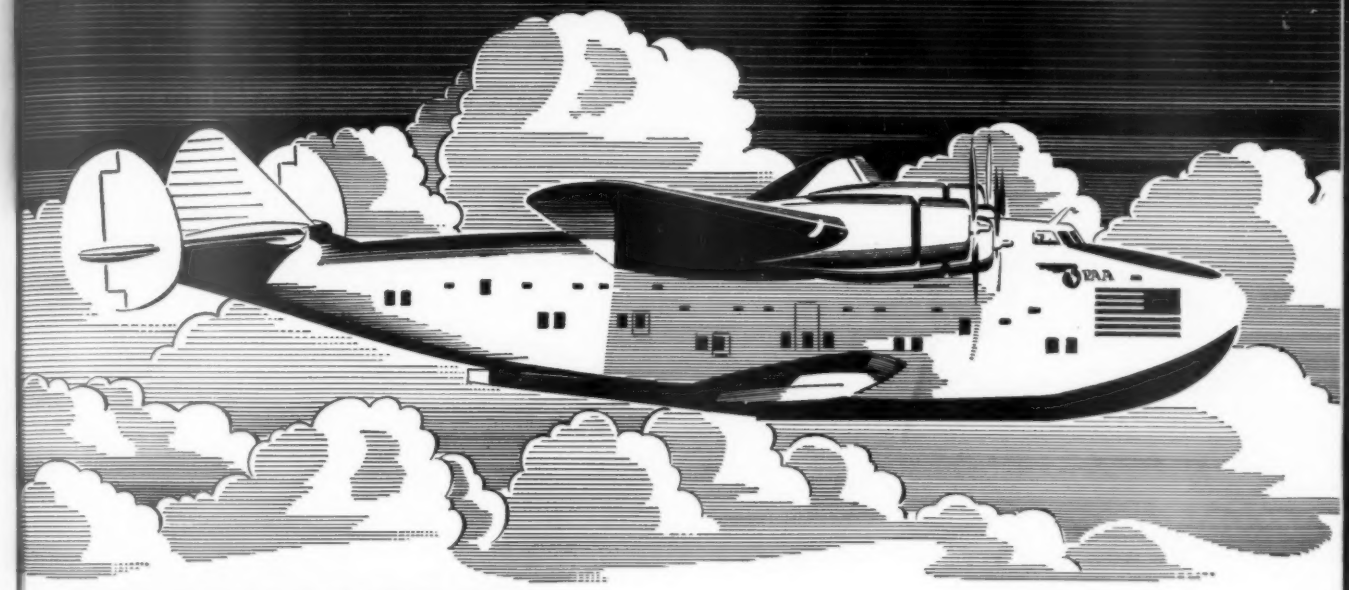
Meanwhile, the Morrow Board had recommended against a separate air force, and so had the special House committee on aviation, although the latter did propose a unified Department of National Defense with a single procurement agency for both Army and Navy air arms.

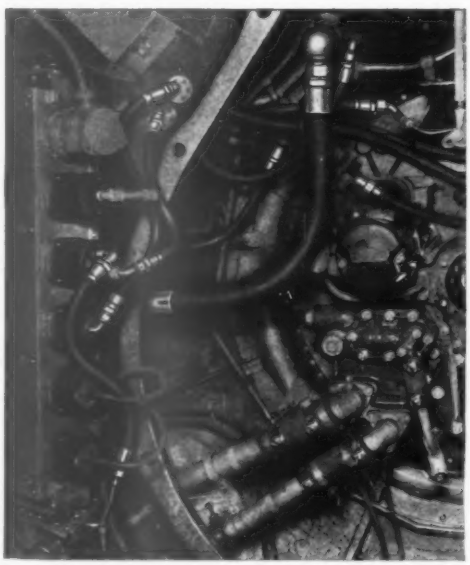
Mitchell, rejecting several suggestions that he enter politics, among them that he run for the Senate against Senator Lenroot of Wisconsin, and another that he become police commissioner of New York under Mayor-elect Jimmy Walker, said he preferred not to be tied to any political party and was planning a lecture tour to spread his already widely-discussed views on aviation.

He soon settled down, however, to the life of a country gentleman on his estate in the hunt country of Virginia near Middleburg. Occasionally he emerged from this retirement to make a speech, or write another magazine article or book, but as the years passed he took a less and less active part in the aviation affairs which had made his Army career such a stormy one. While in New York in January, 1936, he suffered a heart attack and, three weeks later, he died at Doctor's Hospital there. He was buried in Wisconsin.

PAN AMERICAN'S BOEING CLIPPERS

Rely on Weatherhead





Weatherhead flexible hose and fittings installed for gas and oil lines on Wright Cyclone engine of a Pan American Airways Boeing Clipper.

POWERED with Wright Cyclone Engines, the great Boeing 314 Clippers of Pan American Airways are transporting men and materials vital for the war effort to all parts of the globe.

The smooth operation of these great ships in their history-making flights depends in a large measure upon Weatherhead hose, valves and fittings used in oil, fuel, vacuum, and engine pressure systems. These parts include Dural Tube and Pipe Fittings and High, Medium, and Low Pressure Flexible Hydraulic Hose Assemblies. In addition to aviation fittings and hose, Weatherhead produces Vacuum Selector and Check Valves; Hydraulic Check Valves; and Hydraulic Actuating Cylinders. All are manufactured to Air Corps, Navy, or "AN" specifications. Each part has been engineered for mass production to provide the increasing output so essential today.

THE WEATHERHEAD CO. ★ AIRPLANE DIVISION

East Coast Office: New York, N. Y. ★ *Main Office:* Cleveland, Ohio ★ *West Coast Office:* Los Angeles, Cal.

WEATHERHEAD

Such, then, in brief was the career of Billy Mitchell. And what of the validity of his opinions?

The vulnerability of surface ships to air attack is of course no longer a matter of dispute and the makeup of surface navies is sure to be altered radically as a result of the present war's lessons. The employment of warships of every category is being studied frantically by naval men the world around and naval tactics are in a state of violent flux. What form the new navies of the world will take is something that no one, not even a Billy Mitchell, could say at this moment.

It seems beyond question that this state of flux has been produced, principally at least, by the impact of air power. Yet air power has not so far produced the solution of the problem it poses. The functions performed by surface vessels are essential functions and while some of those functions can now be performed by air, the sea power still is essential.

It might be well here to note a fact which escapes general public attention—and, oddly enough, seems to have escaped Mitchell. It was a strange oversight for him, because it is a factor that strengthens his concept of an independent air arm—the fact that sea power and air power are essentially similar. Sea power, in essence, is the ability to control and use the ocean—control with warships and use with cargo ships, and by blockade to deny that means of commerce and communication to the enemy.

Similarly, air power is not warplanes alone, but war and commercial planes. The function of the warplane is not only to destroy military objectives; it is also to control the air to permit a continual flow of traffic in transport planes, while denying use of the air to the enemy's war and commercial aviation.

Mitchell's argument that planes can destroy battleships, however true, is subsidiary to the fact that air power, in its broad and only real sense, can be expected eventually to destroy the value of an enemy navy even if it never bothers to attack an enemy surface ship, by the simple process of taking the functions of surface ships into the air and by-passing the navy.

Despite the entirely understandable public habit of discussing both air and sea power solely in terms of instruments of war—understandable because battleships and bombers are obvious symbols of might—the airplane is more than just a weapon. It is both weapon and transportation, and the combination of the two form a "power" which has not yet, but with progress may eventually, relegate sea power to a secondary place.

For the present, while the provision of air protection is no guarantee that some of a navy's surface ships will not be sunk by attacking aircraft, it certainly eliminates what Mitchell apparently believed was a guarantee that the attacking aircraft would inevitably be successful.

The colonel's scorn of antiaircraft guns has hardly been justified by this war's developments. In retrospect, it would seem that Mitchell, foreseeing an almost fantastic development in the efficiency of planes, overlooked completely the possibility that antiaircraft guns would not remain forever the primitive and inefficient weapons of the type he saw in use in 1917-18. The modern antiaircraft gun, as a matter of fact, is a far better weapon than anything Mitchell knew and, while of itself is obviously not a sufficient protection against air attack, certainly it is a device which no sane general or admiral would discard.

Mitchell's prediction that future wars must be fought only in the air, with no meeting of ground armies, are not borne out by the lessons of the present conflict. Millions of men are locked in a struggle on the ground along the length of Russia and the world's most powerful air force failed to prevent that or to bring the German armies to Moscow. Bataan in the Philippines fell, not just to Japanese air strength, but to hunger and an overpowering horde of fresh troops on the ground. In Lybia the power of tanks has been at least equally important with strength in the air.

The nearest approach to a purely air conflict that this war has produced—the Battle of Britain—was an almost perfect illustration of Mitchell's text of air armadas of fantastic size blasting military objectives into rubble and dust, with no ground armies involved. But Britain still stands and, moreover, her production and the morale of her people have risen steadily.

On the other hand, Crete was a contest between air power in its broad sense on one side, and sea power, without even air support, on the other—and sea power had to retreat. But even in Crete part of the function of air power was to put ground troops on the scene to take and hold territory, a function that warplanes cannot perform.

Mitchell also appeared to miss the vital role that the aircraft carrier was to play. He scorned the carrier as being an illusion. Actually, the aircraft carrier is a floating landing field which can be moved near the scene of intended action, thereby giving enormous range to fighting planes. Actually, the greatest blow in this whole war so far was that suffered at Pearl Harbor, which paralyzed the opposition to the Jap operations in the Pacific and permitted their almost unopposed conquest of Malaya, the Dutch East Indies and most of the southeastern islands, to say nothing of the Philippines themselves. The blow at Pearl Harbor was struck from airplane carriers.

The unification of the United States' Army and Navy air forces in an independent air arm might have achieved the more rapid development of American air power which Mitchell believed it would accomplish, but there is no certainty that this would be the case. As long as surface ships are essential, the planes which protect them are not a part of our air power but essentially are a part of our sea power. The job to be done is to control and use the ocean lanes of travel, and if the means finally should be cargo ships protected only by aircraft, with surface warships eliminated entirely, it still would be sea, not air power.

So far as the various war arms are concerned, the independence of air from the ground and sea operations or a general command has been shown by actual conflict to be undesirable, and at times disastrous. Italy's independent air force mistakenly bombed Italy's navy. The need for air support for British ground forces in France on a Tuesday afternoon is hardly filled by a Royal Air Force decision on Wednesday morning that maybe they can spare the planes from their own independent operations—a hypothetical case, but one with unfortunate actual parallels.

"My husband's a pilot. He always screams in a power dive . . ."

"KNOW-HOW" MAN AT WORK

THE tires on one model were literally burning up from heat generated by the brakes — 400° at the rim. Sure, the wheel and brake assembly could be redesigned on newer models but what about the hundreds of planes in service? Rubber was being wasted, and time lost in needless tire replacements.

The local U. S. Airplane Tire Field Engineer was asked to find a solution. He went to the airfields and studied the landing and taxiing conditions. He checked with the company engineers and made his recommendation to the United States Rubber Company. Result: a special heat resisting rayon tire and fabric-base tube that solved the annoying problem.

This is routine work for members of the U. S. Field Engineering and Service Department—the only department of its kind in the tire industry, more important now than ever after 15 years of experience in helping make tires last longer.

Wherever you are, whatever your tire problem, there is a U. S. Field Engineer near you who can help you solve it on the job, and right now. Use him!

ROYAL AIRPLANE TIRES

ONLY "U. S." HAS THESE EXTRAS

1 **TEMPERED RUBBER TREAD**—A tougher, scuff- and heat-resistant tread compound for airplane tires.

2 **SAFETY BONDED RAYON CORD** — A lighter, more resilient, airplane tire material with tremendous impact resistance and stamina at high temperatures.

3 **FIELD AIRPLANE TIRE SERVICE**—A force of "U. S." field engineers in every part of the country is promptly available for engineering and technical help on tire and undercarriage problems.

4 **"U. S." ICE GRIP TREAD**—A tread of revolutionary design and performance for snow- and ice-covered landing surfaces.

5 **STATIC GROUND CONSTRUCTION** — Conductive rubber construction grounds static electrical charges upon contact with the ground. This safety feature is available in every U. S. Royal Airplane Tire.

RAYON IN EVERY U. S. TIRE — A U. S. TIRE FOR EVERY PLANE

UNITED STATES RUBBER COMPANY

AIRPLANE TIRE DEPARTMENT • 6600 E. JEFFERSON AVE. • DETROIT, MICHIGAN

Indeed, far from moving toward independent action by the various components of our fighting strength, we have moved toward centralized and co-ordinated command. In war theaters, American forces of all kinds are commanded by the senior officer of that branch—land, sea or air—which carries the principal burden of the campaign.

In this respect, the present war has justified beyond cavil the wisdom of Mitchell's views on command policy. The unanswerable arguments of war have forced a close co-ordination of action and unity of command, not only affecting the armed might of this country, but—through the combined chiefs of staff in Washington—the whole war strategy and operations of the United Nations.

It should hardly be necessary to add, too, that a critical examination of many of Mitchell's statements and views in the light of detailed developments which came long after his death does not diminish in any way the fact that Mitchell, ahead of any man of his time, knew and tried to impress on his country that air strength would dominate any war in which the nation became involved, and might easily be the decisive factor.

That is the thing that Mitchell knew and that, for very human reasons, he failed to teach to a sufficient number of others. He probably could not have accomplished a great deal more than he did had he lived many years longer and served until retirement age in the Army. The country would not believe that war could come again and probably not even the zeal of a continually active Billy Mitchell could have convinced it.

No one knows what Mitchell's ideas would be today, but it's a safe bet that the combat actions of this war would have found him a keen observer and wise student, had he lived to know them.

END

Plane Short Cuts

(*Continued from page* 39)

must all be originated either from preliminary design drawings, experimental mock-up or the prototype test ship, and be so simple and clear that a new employee can understand his duty on the first day of work.

On the subject of production illustrations, E. M. Wales, Vega's administrative engineer, has this to say:

"Several people, at different times, appear to have had the idea of a production illustration group. Industrial engineering has used perspective sketches for educational purposes and the tool planning department used them in airplane manufacturing breakdowns and in working out jigs and fixtures. None of these, however, seemed to fill the entire bill.

"The real need for a group of engineers, devoted entirely to illustrating, arose from the tremendous increase in factory personnel as a result of increased war production. The need for speed in all departments, especially engineering and the factory departments, became more and more apparent. And it was already apparent that one place where speed was lacking, through the fault of no one, was in the reading of blueprints.

"It was brought out that it was not a rare thing to see a foreman or leadman interpreting prints for the shop men with the help of scribbled sketches on the backs of envelopes, on table tops or on scrap metal. But always they were attempts at perspective or at least isometric drawing.

"In the engineering department the same situation existed. Layouts of contoured parts were a constant source of anguish to the various people who were obliged to read them—production engineers, project engineers, men from materials, stress, outside production and many other departments. To each one, somebody had to explain what the maze of lines meant before that person could visualize the part and make the decisions or calculations that concerned him or his department.

"One day an armament engineer developed a proposal for a spherical nose turret which, in its layout form, was particularly difficult to visualize and understand. He called on a junior detailer named Bob Howe, who was formerly a commercial artist, to make up a sketch of this turret so he could more easily explain it to the project engineers. The sketch was quite successful and drew considerable favorable comment.

"Not long after this, a general memorandum was issued to all engineers specifically encouraging the use of freehand sketches to supplement and clarify layouts. It was suggested in this memorandum that any men who were particularly adept at this type of drawing should be considered available to other groups than their own for doing this work where it was deemed necessary.

"It was the idea of Bob Howe and Harold Gooch, another Vega engineer, to establish a department whose job it would be, in effect, to read difficult blueprints (with the help of the men who drew them if necessary) and interpret them through the medium of perspective drawings. A group was set up to handle this work.

"Other aspects of the value of such a group immediately became evident. These drawings would be of real use to tool planning, factory planning, fabrication, inspection, assembly, etc.

"The manufacture of aircraft does not lend itself well to mass production. Progress is being made daily in furthering its adaptation to assembly line construction, but the retarding factors are peculiar to aircraft and are not easily circumvented. The thousands of pieces of metal, the myriad rivets and endless equipment require, in their assembly, infinite care and knowledge of the job. But with the rapid turnover of personnel in an expanding industry, new men must be continually added to each job. It is in helping to educate these men to their new jobs and in saving the men themselves a tremendous amount of blueprint reading time, that production illustrations have proved invaluable."

In many cases, the major problems of engineering are minor problems in the shop and conversely, the major problems of the shop are not adequately covered in design drawings by the engineers. To bridge this difference and facilitate visualization of assemblies, the illustrative sketches were introduced at Vega at the time the *Ventura* bomber was released from engineering to the shop.

The first sketches were drawn freehand in isometric, run off on the Ditto machine and distributed to the shop. Tests were then made to determine the value to assemblers on the floor. Two crews — one with an illustrated sketch and one without—were assigned to assemble the left and right hand spar respectively. Crew No. 1, working with

"Gentlemen, Congress suspects sabotage in the parachute factories—and it's up to us to disprove it!"

TRAINING THEM FAST... *at Lower Cost*

FRANKLIN DEPENDABILITY has proved itself as never before in Civilian Pilot Training. CPT school operators everywhere are learning they can train more pilots faster, and at lower operating costs, in Franklin-powered planes. A recent letter from Louis Soukup of the Oregon Aircraft Service, Klamath Falls, Oregon, is typical. He writes:

"Our six Franklin 65 J-3 Pipers have taken sixty Spring Civilian Pilot Training students through our course in seven weeks.

"These engines have from 400 to 1700 hours on them, practically all of it in operations from 4100 to 7500 ft. above sea level. To date on the entire group of engines, the only parts replaced during the seven weeks were: 1 set of magneto points and 1 rocker box cover gasket."

That's an amazing record, but no more than Franklin-powered plane owners everywhere expect . . . and get . . . from their engines.

You can have the same dependability and freedom from repair costs with any of Franklin's four great engines . . . 65 to 130 H.P. Go modern . . . **SPECIFY FRANKLIN**

AIRCOOLED MOTORS CORPORATION ★ SYRACUSE, NEW YORK

sketch, assembled the first unit in 1.9 hours; crew No. 2, working without sketch, completed the first unit in 5.4 hours. The inspection department used about the same proportion of time. This time differential, on a structural item, is greatly magnified on functional installations such as electrical and plumbing.

A further refinement in illustrative techniques is the introduction of photo-tracing processes. Many complex wiring assemblies, harnesses and junction boxes are of necesssity "mocked-up" before wiring lengths can be determined. Most of these assemblies can be photographed at advantageous angles, with a saving of cost over the isometric sketch process. Witness lines and identifying detail part numbers are then keyed to the photograph and a process or route sheet is made up showing operational sequence, part quantities and involved jigs and attachment tooling. This accumulation is then developed on a transparency from which any number of blueprints can be made.

Previous to the introduction of these illustrations, many changes in engineering documents were requested from the shop, due largely to differences in wire lengths occasioned by varied assembly procedure between groups on day and night shifts. For example, when two cables cross each other in a confined space, one crew puts cable "A" under cable "B", the other crew reverses and puts cable "B" under cable "A". This changes the required wire lengths and hence a request to engineering for a print change. When the next lot of these assemblies reach the shop to be assembled on the opposite shift, another change is requested to restore wires to original length, etc. By posting the photo-illustration over the assemblers' bench, this condition has been eliminated.

The illustrated sketch, then, though not new as to basic idea though new in some of its modernized aspects, becomes a very valuable tool to engineering, planning, tooling and manufacturing divisions. The time savings accumulate in direct proportion to the number of functions involved and to the number of new operators to be trained.

Plant and manufacturing engineers at Lockheed have contributed much to the speed-up by means of installing superior equipment as well as devising more streamlined methods of material handling. As an example, instead of using individual tanks, as in the past, acetylene welders now work off a line from the central station with individual gauges. Each man now has his own welding table equipped with individual turntable, controlled by the feet, like an ancient potter's wheel, to turn the work to him. Also, each man now has his own individual automatic pilot torch lighter and holder which shuts off flame when not in use, lighting it when ready without making it necessary to take time out to adjust the torch, as was formerly the case.

To speed up operations in the sheet metal department, several new machines have been installed. Where in the past even the smallest shearing operations were performed on heavy duty steel 12- and 16-foot shears capable of no more than 40 to 60 strokes to the minute, Lockheed now is using for this work small 16-inch high speed shears that can cut out 120 strokes a minute. The large heavy duty shears are used only for cutting large sheets of metal.

A better arrangement of space, ventilation and loading and unloading tables have created a swifter, steadier flow of sheet metal through the router department. Until recently, all hydro-press forming was done on two huge presses of 2,500 and 4,500 tons capacity, costing about $60,000 and $80,000 respectively and requiring some 20 men to handle about 12,000 parts in eight hours. These have been augmented by a 250-ton single-action hydro-press with a rotary table that can handle more than 20,000 parts in eight hours with only five men. The rotary table was designed by Lockheed equipment designers and the Clearing press to which it has been attached cost only $25,000.

"Guess that wasn't the door to the men's room after all . . ."

The company also has three new double and triple acting hydro-presses of 125, 250 and 800 tons. Using either Kirksite or steel draw dies, these make deep draws and perfect parts which require a minimum of re-work or trimming. This equipment is replacing drop hammer work to a considerable degree, and in many cases their value is enhanced by the fact that they eliminate heat treat for the reason that with the steel die it is possible to use ST, which is already heat-treated when formed.

Lockheed and Vega now have two of the most modern small parts paint shops in the aircraft industry, in each of which it is possible (working at full capacity) to paint 300,000 parts a day. There are DeVilbiss slat conveyors, dip line conveyors for odd-shaped parts and an overhead continuous conveyor for all color coat work. Parts sprayed with zinc chromate are dried in 20 seconds by a battery of infrared lights.

It is the belief of the works manager's office that the most important thing done to date to speed production is the inauguration of the stationized assembly line, using the continuous and progressive production methods so long desired. An attempt has been made to furnish the workman on the assembly line with a job breakdown of the parts according to a stationized procedure. In doing this, a survey is made of the number of stations which will probably be required to complete the airplane in final assembly and then a breakdown of all parts used in the final assembly is attempted. The manufacuring engineer in attempting this job breakdown confers with shop men as to probable ways of installation in order to improve their own analysis work.

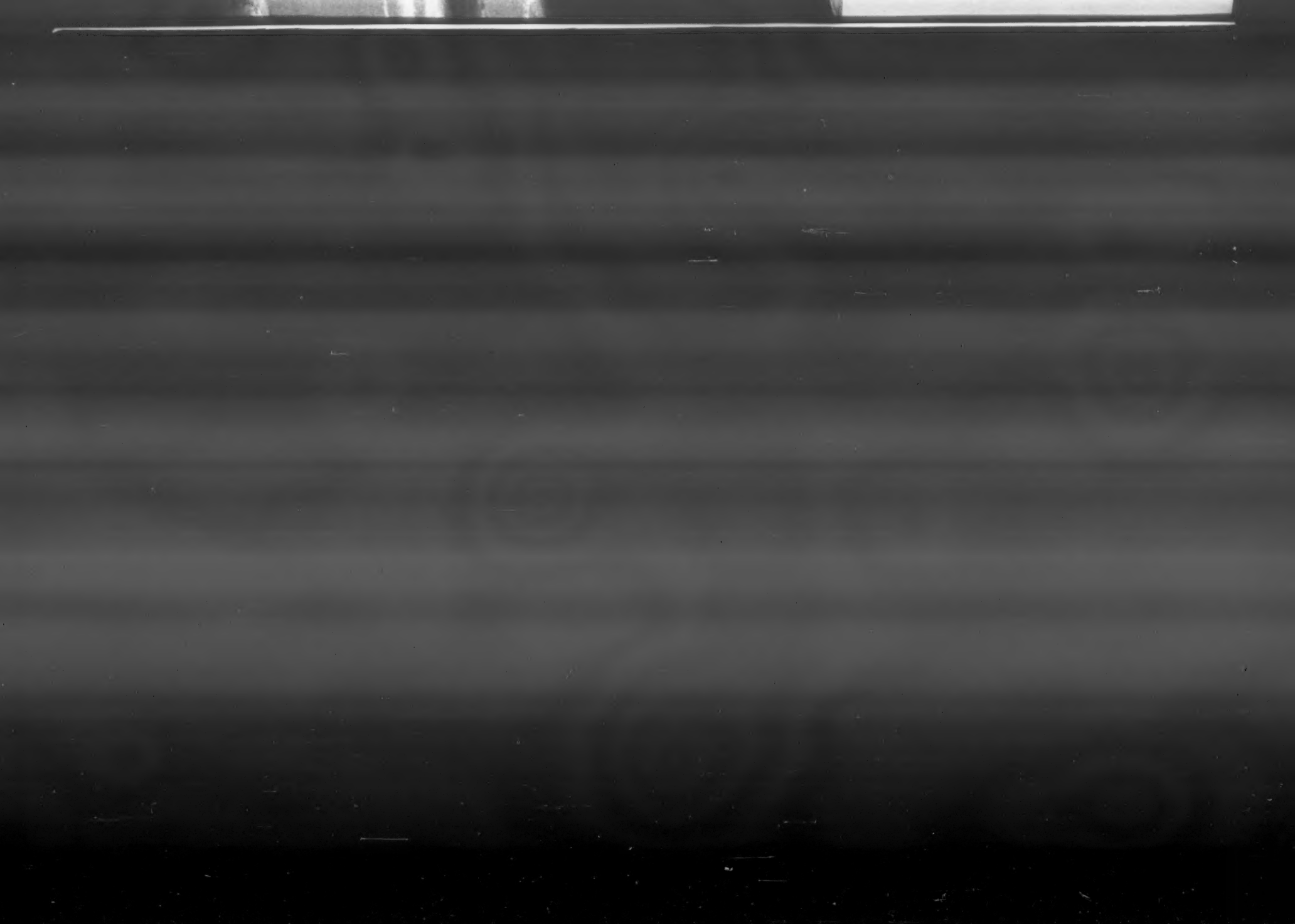
In attempting a breakdown of the assemblies, a system of placing all the parts required for one job into a kit or container has been developed. Parts required are listed on tabulated forms. This form indicates on what station the parts will be installed. The whole airplane has been broken into sections or work areas, as for example: left-hand engine, lower cockpit, right-hand aft boom, etc. The jobs are allocated according to this breakdown and according to the functional work (such as electrical, plumbing, armament, structural, etc.) in the area of the airplane. It is here that the production illustrations aid the assembly worker.

Men have been assigned to a particular location and are responsible for a definite amount of work in that location. They are charged with seeing that work is done on time so that the plane moves on schedule with no apparent time lost during the regular shift hours. Plane moves from station to station are made between work shifts so that assembly work is not interfered with.

This carefully designed and supervised procedure makes it possible to eliminate all delays during the period when a new shift is "taking over." Each worker goes to his assigned task and starts work immediately.

Manufacturing engineers have been assigned to different stations in final assembly, just as workmen have been, and their job is to aid the workers in every way possible to simplify the work. Each engineer (or group of engineers) has full responsibility for planning complete man-

(*Continued on page 76*)



A New Name in Today's Skies

WITH A REPUTATION YEARS OLD

Now, under the name Joyce Aviation, Inc., Airchox Company, as a division, continues to build the precision equipment so vital to the progress of world aviation.

AIRCHOX COMPANY
Division of
JOYCE *Aviation, INC.*

General Offices, 8 So. Michigan Ave., Chicago

PARACHUTE HARDWARE • COLLAPSIBLE WHEEL CHOCKS • EXACT AIRSPEED COMPUTER • MOORING ANCHOR KIT
TOW-TARGETS FOR AERIAL AND ANTI-AIRCRAFT GUNNERY • AIRCRAFT SPINNER AND PROPELLER BLADES

Strategic Conservation

In mid-year of 1940 Beechcraft and the Army foresaw the present metal shortages and planned together the wooden buildings and wooden airplanes seen below. Neither the buildings nor the airplanes are in any way inferior to comparable units constructed from metal . . . Beechcraft's buildings have saved enough steel to build many hundreds of tanks and the Beechcraft AT-10's will release enough aluminum for more than a thousand fighting airplanes . . . Beechcraft for almost two years has carefully segregated its metal scrap, reclaimed its industrial solvents by re-distillation, in every way promoted conservation of strategic material . . . Beechcraft's experience indicates that this course of action not only is helpful to our country but also is good business.

Beechcraft AT-10 2-engine plywood trainers being assembled in one of Beechcraft's modern assembly buildings also built of wood.

Beech Aircraft

CORPORATION

BEECH AIRPORT · WICHITA, KANSAS, U.S.A.

Industrial Aviation SECTION

CONVEYOR SPEEDS PRODUCTION

by E. P. KENNEDY
Production Manager, Aeronca Aircraft Corporation

ON June 11, 1940, when the Aeronca Aircraft Corporation moved its factory from Cincinnati to a site on the municipal airport in Middletown, O., it was thought that our production problems were over. We had just gone through a disastrous flood that swept over the Cincinnati municipal airport and found it most annoying to try to operate a factory and build airplanes with the airport under water and miniature waves moving along the final assembly floor. Our new plant at Middletown was laid out for the most efficient production for we planned to move the fuselages in a straight line from the welding department through the sub-assembly department and then out of final assembly to the test flight ramp.

This was slightly over two years ago—a time when the CPTP was first picking up momentum and the noticeable increase in pilots was just becoming apparent. The upswing in aeronautical activities that began about this time soon made it necessary to streamline our production facilities again in order that we might keep ahead in production and meet the rising demand for airplanes. We thought we had refined our manufacturing methods, but when the need for more airplanes occurred we necessarily had to go all over our production set-up again and devise additional short-cuts.

After discussing the possibility of a conveyor that would move the fuselages through the various departments, a preliminary layout of such a system was made which proved surprisingly adaptable to our type plant and production system.

Upon investigation we discovered, much to our surprise, that the conveyor equipment on the market would not take care of our requirements.

Accordingly, we set up an experimental section of a monorail track of our own design in the shop and developed a carrier which held the fuselages rigid for welding, fairing or installation work. The carrier permitted the fuselages to rotate so that work could be done on all sides of the ship without requiring the workers to get into cramped positions. The fuselage, of course, is easily moved from one department to the next on this overhead track.

In order to conserve material, 75 per cent of the requirements for the conveyor installation were made of reject raw materials on hand at the plant. The complete system of trackage and carriers, including several switches and turntables, was made by the men in the plant who had had no previous experience with this type of equipment, and it is a tribute to their skill and ingenuity that no difficulties have arisen since it was put into operation.

Fuselages are now put on the overhead conveyor in the welding department and after the welds have been finished, are moved to the two fairing stations where the wood trim and fairing strips are put into place. At the fairing station the ship experiences its first "slow roll", for it is turned upside down and in several other positions and temporarily locked so that work can be done to the best advantage. The ship moves from this position over a series of switches into a spray booth for a zinc chromate primer corrosive prevention treatment.

After spraying, the ship is rolled along the monorail to the primary assembly departments for installation of the controls, tanks, instrument lines, etc. The firewall which is put on the fuselage at the welding department is permanently attached at this point.

Next the fuselage passes along the line to the covering department. Here in Aeronca's all-girl department the fuselages are horizontally rotated so as to cover the complete fuselage with a minimum of effort. Each side, top, and bottom of the ship is successively placed in a horizontal position for ease in the application of the fabric.

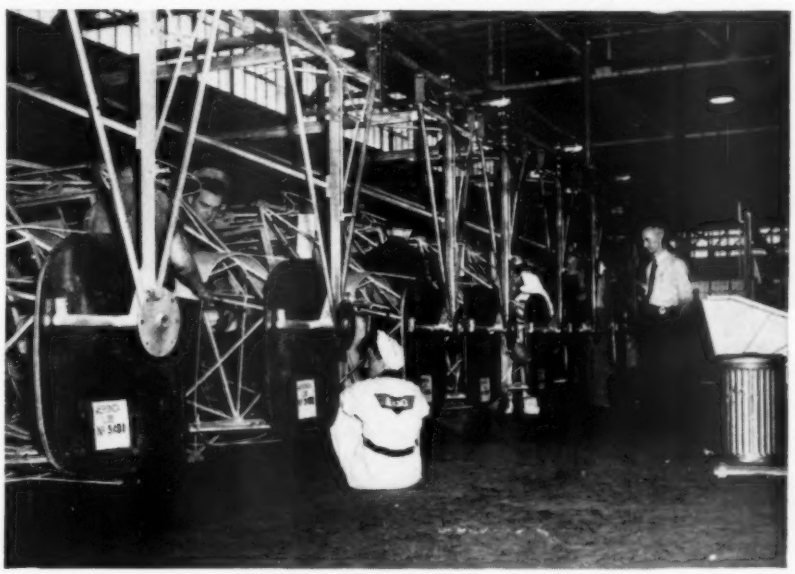
After covering, the ship is delivered to the dope room on the monorail and then sent along to Final Assembly.

We have found that the best and most efficient method to get an airplane in the air as promptly as possible, is to get every manufacturing process that we possibly can on wheels. Just getting things on wheels seems to facilitate their passage through the various departments and on out to final assembly and that all-important first take-off.

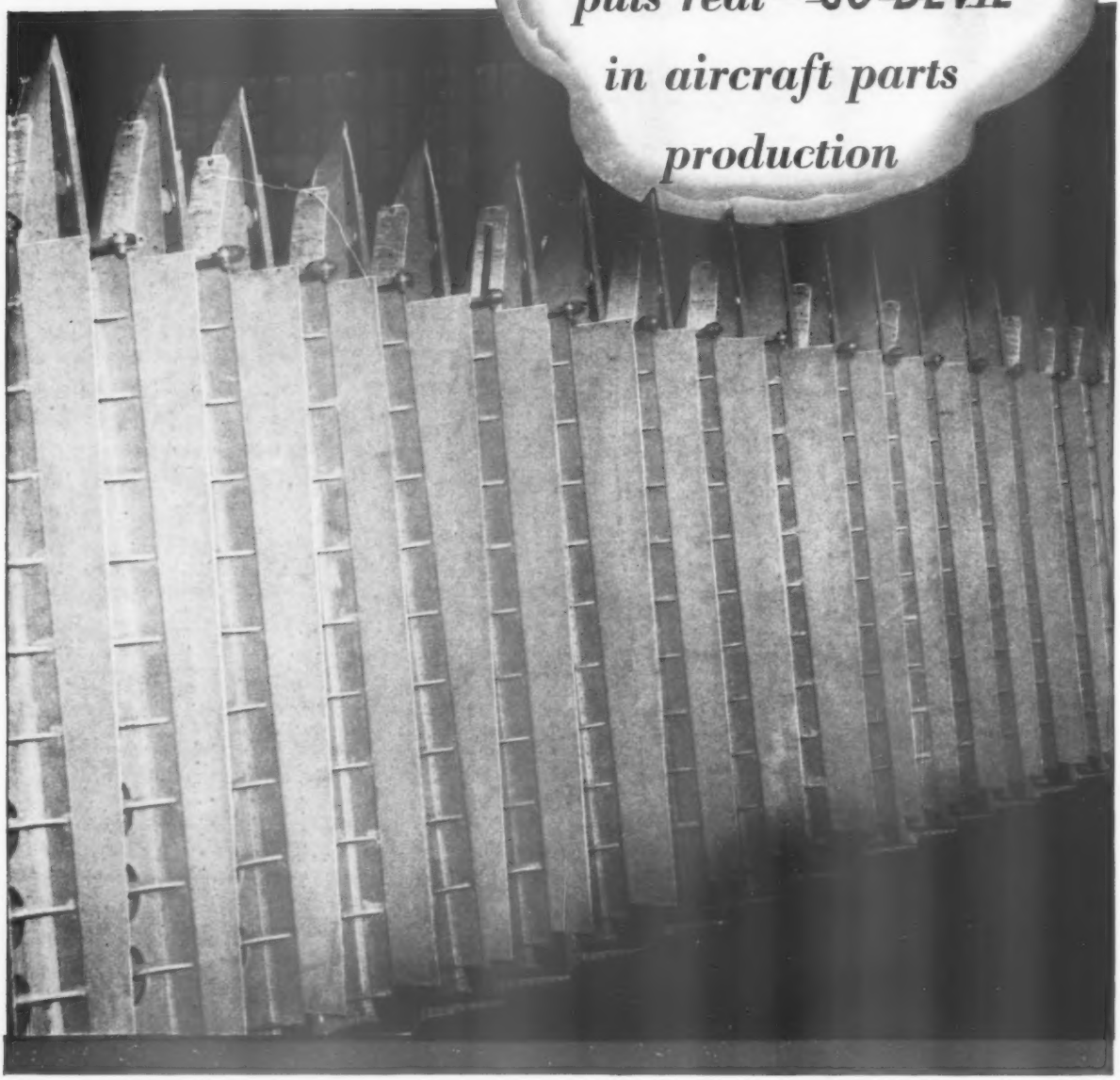
Our overhead conveyor has gone a long way toward taking the unnecessary fatigue out of production and has facilitated the numerous inspections we require. The number of ships in process in the plant has been reduced by 40 per cent, which affords a much more efficient use of our productive area.

END

This overhead conveyor, designed and built by Aeronca to accomplish a specific task, has permitted a reduction of 40 per cent in the number of planes in process at a time.



FLEETWINGS puts real "GO-DEVIL" in aircraft parts production



A line-up of completed fins—Plant 1, Fleetwings

IN ALASKA, "go-devil" means a special sled. In the Texas oil-fields, it's the name for a fast-moving gadget that keeps pipelines clean.

At Fleetwings, we're so intent on permanently denting the Axis . . . that "go-devil" on our production lines means "let's-turn-out-airplane-parts-faster!"

That's exactly what Fleetwings is doing. We are producing fins and fuselages, stabilizers and spoilers, rudders and turret rings, ammunition boxes and hydraulic valves. Parts are rolling off streamlined assembly lines in the Fleetwings plants at an amazing rate for America's fastest fighters, torpedo and dive bombers . . . for giant four-engined air fortresses.

Today Fleetwings leads the aircraft industry in making planes and parts of stainless steel, because, during many yesterdays, our engineers have used their ingenuity to develop new and better production tools and fabricating methods.

Tomorrow, who knows? Certainly the skill and inventiveness shown by Fleetwings in designing and building both stainless steel and aluminum alloy parts and complete planes, both metal and plastic, will prove increasingly valuable. It's worth keeping in mind, as *you* plan for the future.

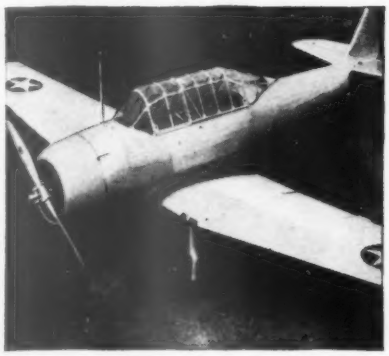
★

FLEETWINGS

Incorporated

BRISTOL • PENNSYLVANIA

FLEETWINGS
pioneers with parts and hydraulic equipment



The BT-12, all-welded basic trainer built for the U. S. Army Air Forces.

FUTURE AIRCRAFT ADVANCES are taking shape *now* on the drafting boards and along the production lines at Fleetwings. Years of pioneering in the spot, seam and projection welding of stainless steel are paying dividends in faster output . . . when *speed* counts! Fleetwings engineers are now working on new designs that will show what stainless and other alloy steels will really do.

SPEED is essential when a prime contractor wants parts in a hurry. Fleetwings has developed a special Engineering-Liaison Service that helps any prime contractors. Several months ago, for instance, a fighter manufacturer furnished us with contours, loads and weight requirements for tail surfaces. We designed the surfaces, made production drawings, started assembly lines rolling, and delivered the first set in less than 60 days. Today, these surfaces are flying on one of America's top-speed fighters.

RETRACTABLE LANDING GEAR, wing flaps, gun turrets, gun firing gear, bomb doors, engine cowling flaps, control surfaces, engine controls, automatic pilot . . . those are just a few of the hydraulically operated mechanisms on military and naval aircraft controlled by special hydraulic valves and hydraulic jacks designed by Fleetwings engineers. Fleetwings has been designing highly efficient hydraulic actuating mechanisms since 1938.

"KEEP 'EM FLYING!"

FLEETWINGS
Incorporated
BRISTOL • PENNSYLVANIA

WORKERS' SUGGESTIONS PROVE PRACTICAL

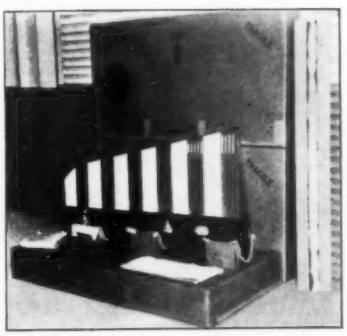
VOLUME output of Packard marine and Rolls-Royce aircraft engines has benefited greatly as the immediate result of more than 4,000 shop suggestions from workers. Ideas are carefully checked and, when feasible, are put into shop practice. Of the total suggestions submitted, fully 30 per cent covered ideas for production betterment, an unusually high percentage in a program of this kind.

Full protection is granted the Packard worker whose suggestion may prove patentable. The standard form on which each idea is submitted reads, in part: ". . . if there is anything patentable about it (the suggestion) I retain the sole right to patent it and grant licenses to others." A numbered stub is retained by the worker, whose suggestion on a duplicate-numbered form is reviewed anonymously, checked for practical shop application and judged solely on merit.

Crude drawings, rough sketches or semi-professional drafts are often submitted to illustrate suggestions. Production ideas vary from a new design of dynamometer starter connector that saves time and money, to a change in testing procedure that prevents costly teardowns. Some of the others include a machine drill to replace a hand chamfer operation, a fiber cover over part of an engine assembly to protect it during construction, a screen box instead of the hand to hold small parts for inspection, washing, etc.

These five Packard workers were among those submitting 1,200 practical ways of cutting costs, speeding production.

PAPER BOXES FOR PLANE PARTS



Corrugated cardboard shipping boxes are proving safe containers, Stinson reports.

THE Stinson Division of Vultee Aircraft, Inc., has taken a tip from peacetime shipping practice by using corrugated boxes for the shipment of important warplane parts. It has been found that corrugated board best meets the requirements for effective, lightweight packaging, and, at the same time, makes possible economies in time, money, space and the important item of shipping department labor.

Collaborating with the Hinde and Dauch Paper Company, E. R. Wiles of Stinson developed several basic styles of boxes for use in shipping ailerons, wing flaps, wing tips and rudders. The corrugated boxes are of rugged construction, providing adequate exterior protection, and at the same time the natural resiliency of corrugated board makes them particularly suitable so far as absorbing shocks is concerned, permitting parts to reach their destination in perfect condition and with surfaces unmarred.

METAL SUBSTITUTES

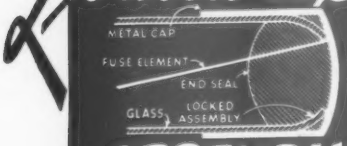
THE Aircraft War Production Council, comprising eight major aircraft manufacturers in southern California, announces that the substitution of plastics and plywood in one type of warplane is now saving as much as 1,000 pounds of strategic aluminum per plane. The Council, with headquarters in Los Angeles, was formed in April to speed the exchange of information and pooling of facilities, as well as the emergency "swapping" of screws, bolts, etc.

Substitute materials are replacing aluminum in such parts as troop benches, window frames, compartment linings and partitions, tail cones, fuselage noses, wing fillets, cabin floors, wing flaps, control surface tabs, nose wheel doors, antenna masts, air ducts, radio shelves and life raft shelves.

Rubber shortage is being met by Lockheed by putting its P-38 intercepter on a strict "reducing" diet. Although it does not show on the plane externally nor in performance, shrewd use of synthetics and rubber substitutes is now saving several hundred pounds of rubber per plane. Bound hair, for example, is being substituted for sponge rubber seat cushions, arm rests and pad assemblies. Other rubber parts are being replaced by felt impregnated with an asphaltic base material and flexible plastics.

KNOW THESE POINTS OF LITTELFUSE PROTECTION FOR BETTER FUSE SERVICE

LITTELFUSE Locked Cap



ASSEMBLY

LITTELFUSE Army Air Corps AC-52271. For general protection in ratings of 20 amperes or less.

SECURES CAPS EVERLASTINGLY PROTECTS THE FILAMENT

By exclusive Littelfuse process (Pat. No. 1,922,642) Littelfuse Caps are so firmly locked no vibration—shock—impact—or twist, can separate them from fuse-body.

Send for Littelfuse Catalog

for full details of these and other Littelfuse superiorities for highest efficiency, greatest mechanical strength, resistance to vibration and fatigue.

Exclusive Littelfuse Design

✓1 Locked cap assembly holds cap and fuse securely.

2 Element twisted at 90° braces against severe vibration.

3 "Goose-neck" non-crystallizing fuse element takes up contraction and expansion. Solves heat problem.

LITTELFUSE INC.

First in Aircraft Fuses—Pioneers in the industry

4793 Ravenswood Ave., Chicago, Ill.

"MY JOB'S IMPORTANT! IS YOURS???"

PREPARE in AVIATION'S MOST VITAL BRANCH

AIRCRAFT INSTRUMENTS

HOME STUDY—LEARN BY DOING!

Practical, complete training on actual instruments furnished by the school—qualifies you for well paying positions with manufacturers, airlines and instrument service and repair stations. Send for CATALOG today . . .

EASTERN AIRCRAFT INSTRUMENT SCHOOL

"Largest in the East"

DEPT. FA 116 NEWARK AVENUE JERSEY CITY, N. J.

PAINT SPRAYER SAVES MANPOWER

A MACHINE to spray the multitude of parts that comprise Martin bombers is in operation at the Glenn L. Martin Company plant, Baltimore, Md., and, operated by five men, does in one-third of the time the work that formerly required the full time of 15 men. Thus, 10 men, badly needed for other work, are released from hand-operated spray guns.

Numerous refinements and improvements have been added to the original apparatus to adapt it more fully to aircraft work. One such improvement is a stack and ventilator arrangement which keeps fine particles of paint from being drawn out through the stack into the air over the roof of the building. In the past, the fine paint "dust" constituted a fire hazard. Now the excess spray is filtered through a veritable waterfall and collected in a tank under the paint racks.

The machine works on the endless belt principle. Small parts are first cleaned and anodized, then brought in baskets on the overhead conveyor system to a point near the robot paint sprayer. Parts are of various shapes and sizes; some slated to go into Navy patrol bombers, others into the construction of bombers for the Army Air Forces as well as the Royal Air Force.

Five men and this machine do the painting of parts in one-third the time required when 15 men did all the spraying by hand.

The entire process, which completely covers every piece with a primary coat of anti-acid paint designed to eliminate, so far as possible, the action of corrosive elements on the metal, takes about 15 minutes. From the robot painter, parts are sent to the stock room or direct to the assembly line.

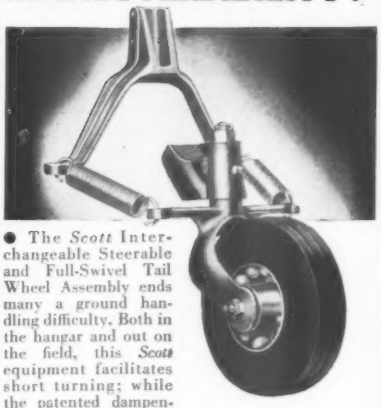
MILLING MACHINE FOR "CYCLONE" CYLINDER

Cooling fins being cut into Wright "Cyclone" cylinders by new milling device.

TURNING at a speed approximating that of wood-working machines, a special milling machine designed according to specifications written by engineers of the Wright Aeronautical Corporation after five years of research, is shown cutting into a machine forged cylinder head for a Wright *Cyclone* engine the long thin fins necessary for cooling.

Development of this forged cylinder head and methods for producing it speedily and in large quantities was recently made public by Wright. The new head allows a 12 to 15 per cent increase in an engine's power output without increase in weight.

Want to Increase Your "GROUND MANEUVERABILITY?"



● The *Scott* Interchangeable Steerable and Full-Swivel Tail Wheel Assembly ends many a ground handling difficulty. Both in the hangar and out on the field, this *Scott* equipment facilitates short turning; while the patented dampening action contributes to smoother steering. *Scott* Standard Full-Swivel Assemblies in service, can be easily and inexpensively converted to Interchangeable Steerable and Full-Swivel Assemblies by adding *Scott* parts.

Scott Tail Wheel Assemblies are standard equipment on most light aircraft. Complete details on request.

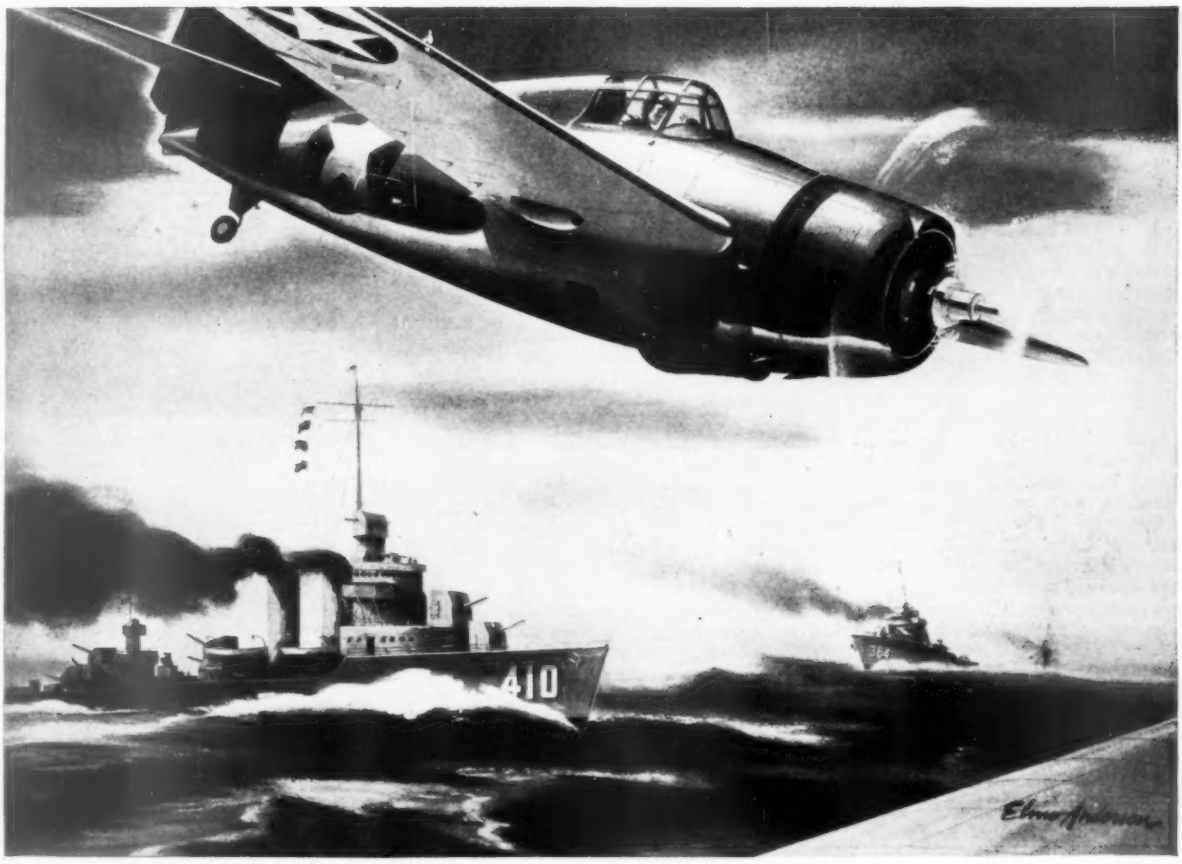
Scott AVIATION CORPORATION

LANCASTER, N. Y., U. S. A.

DESIGNERS AND MANUFACTURERS OF SPECIAL EQUIPMENT FOR THE AIRCRAFT INDUSTRY

Formerly Uniloy Accessories Corporation

SUPPLIERS TO THE U. S. ARMY AIR CORPS.



The Grumman F4F-3, fabricated with Boots Self-Locking Nuts

THEY FLY WITH THEIR BOOTS ON

Somewhere in the vast Pacific another Wildcat wings home to its carrier base. Another job on the Japs has been carried out with dispatch.

This great Grumman fighter, F4F-3 has proven its worth in every battle of the Pacific. Every pound of its sleek structure must be considered in relation to its capacity for speed and stamina. For every pound must be fighting weight.

That's why Wildcats are held together by Boots lighter, self-locking nuts. Not only do Boots weigh less than ordinary nuts, allowing many more pounds for fighting equipment, or fuel, but in addition, they actually "outlast the plane." They are also unaffected by the corrosive action of salt-water or by alternate subjection to dryness and moisture.

Boots one-piece, all-metal, self-locking nuts pass the rigid tests of the Army, Navy and Civil Aeronautics Authority.

BOOTS

Self-Locking Nuts For Application In All Industries

Boots Anchor Nuts are made in a variety of shapes, plain, one lug—one rivet, corner, midget and special base. They are furnished with plain nut bases or counter-sunk for flush mounting. Write for new catalogue . . . Correspondence should be directed to General Offices, not to factories.

BOOTS AIRCRAFT NUT CORPORATION ★ GENERAL OFFICES, NEW CANAAN, CONNECTICUT

TYPICAL EXAMPLES OF AMERICAN INGENUITY

AWARDS of individual production merit have been issued to two employees of the Curtiss-Wright Corporation, airplane division, St. Louis, Mo., it is announced by the War Production Board. The two men, J. G. Heiman and C. A. Westmoreland, won recognition for their suggestion that bins be placed on single dollies so that parts would accompany the assembly, thus eliminating excessive stock chasing. This suggestion is saving 360 man-hours a week.

The Yankee mechanic, normally a peace-loving citizen, is angry—and his ire is inspiring endless ingenious ideas to help hasten the winning of the war by increasing and improving production.

Examples of some of the ideas originating with the man on the machine, as compiled by the Automotive Council for War Production, follow:

An employee who had the tedious task of removing surface blotches from aluminum sheets, suggested a new-type tool which could be used in an electric drill. The same job now is done in 10 per cent of the previous production time.

One worker put a false bottom in the carts which pick up oil-saturated scrap shavings from machines, thus allowing the precious cutting oil to seep through to the real bottom. This eliminated the previous large lubricant losses when the chip wagon was dumped.

Designing and building an extension shaft for the compressed air grinder which he used on his job, another worker was able to reduce grinding time and save large amounts of material, since many of the grinding wheels were eliminated entirely.

On an aircraft job involving numerous hand-filing operations, an idea was submitted by a worker to sand blast the hundreds of files which the company was forced to discard after a short period of usefulness. Investigation revealed that a certain sand-blast method would restore the files and they now are being used over and over again.

Building a new type milling fixture at the suggestion of a worker, one company now is able to mill 40 parts at one loading, where previously the limit was two.

Accustomed to burring an aircraft engine gear by hand, an automotive worker designed a special drill to do the job automatically. The same amount of work that previously took five hours now is accomplished in one.

A suggestion that a machine operation might replace hand filing of an aircraft part has clipped 20 minutes production time from each part.

PORTABLE UNIT

Fluorescent service light developed for the Army finds a place in industrial use.

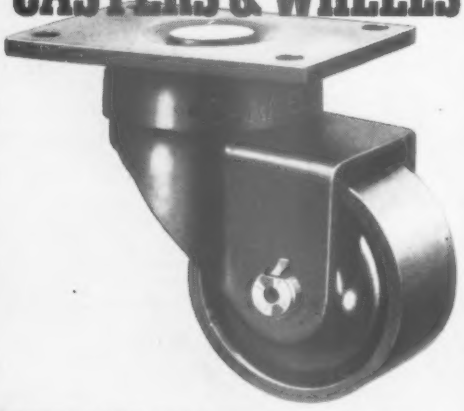
A PORTABLE fluorescent service light, first ordered by the Army for servicing planes at night, now has been developed for industrial use in aircraft factories, where it is used to project light under the wings and fuselages of aircraft in an area which is invariably in shadow from overhead lighting.

Upward or downward, horizontally or vertically, or in any angle of a 180° arc, the unit is adjustable from 30 inches to seven feet without the use of tools and will illuminate any dark area with a long source of cool fluorescent light that permits close working arrangements and eliminates shadows.

A SAVING AT EVERY TURN

DARNELL

CASTERS & WHEELS



DARNELL CORP., LTD., LONG BEACH, CALIF.
36 N. CLINTON, CHICAGO • 60 WALKER ST., NEW YORK

Write For 192 Page Manual

RAF

The Special
SEPTEMBER
ROYAL AIR FORCE ISSUE

FLYING

Available (While Supply Lasts) at all Leading Newsstands Until Friday, October 9th. Price: 50c Per Volume. Get Your Copy Now!

WHO'S WHO IN AVIATION

A BIOGRAPHICAL ROSTER of over 4000 Names

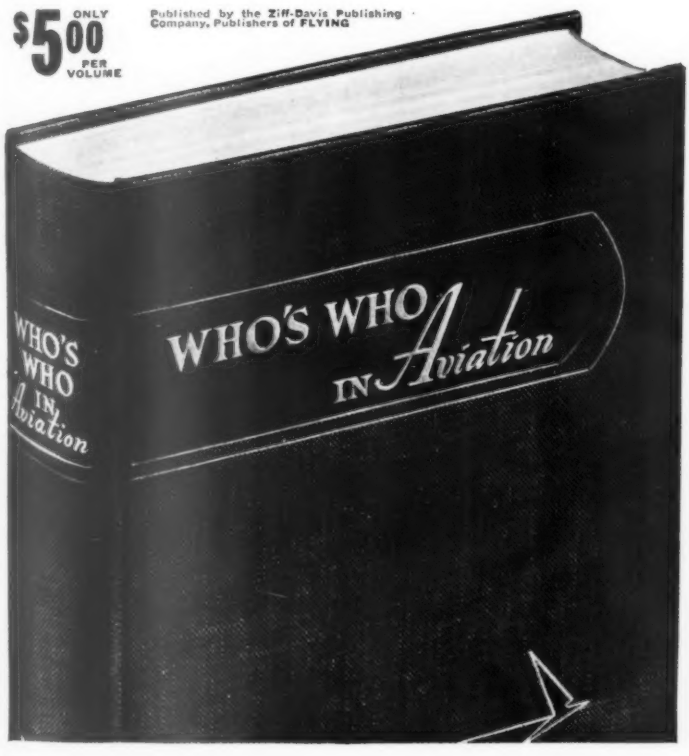
associated with Aviation's dominant role in Modern Life

Now, for the first time, *in one easy-to-use volume*—complete biographical information about more than 4,000 of the most distinguished personalities in American aviation. Men and women whose contributions to aeronautics have been of sufficient importance to earn them the fitting tribute of inclusion in the roll of honor that is WHO'S WHO IN AVIATION.

Over two years of specialized research have gone into the compilation of this book in order to make certain that all branches of aviation, both civil and military, have been covered exhaustively. Those surviving pioneers who have helped make American aviation what it is today as well as the persons who are mainsprings in keeping aeronautics progressing at top speed all are included in this truly comprehensive directory. To insure the greatest possible accuracy, all data was checked against records of federal, state, municipal, and regulatory agencies, Army and Navy directories, the roster of the Institute of Aeronautical Sciences, and standard trade reference sources.

ONLY $5.00 PER VOLUME

Published by the Ziff-Davis Publishing Company, Publishers of FLYING



IT TELLS YOU *these Important Facts*

● Name; present position; present address. ● Date and place of birth; names of parents. ● Education. ● Pilot Record: where learned to fly; certificate number; if commercial pilot; aircraft class; number of logged hours; honors won as pilot. ● Aviation Business Record: complete with position, name of firm, length and place of employment. ● Military Record: rank; branch of service; dates. ● Clubs and Memberships: professional; academic; social; honorary societies. ● Contributor: Books and magazine articles, with date of publication.

ABOUT *these Important People*

● MILITARY AVIATION PERSONNEL. Army . . . Navy . . . Marine . . . Coast Guard. ● Officials of the Civil Aeronautics Board. ● Outstanding educators in aviation. ● Key men of commercial airlines. ● Aircraft manufacturing executives. ● Outstanding pioneers in aviation. ● Noted aeronautical technicians and scientists. ● Prominent writers.

Invaluable to You

The increased importance of aviation to everyday life has created an overwhelming need for aviation data that can be available *instantly*. WHO'S WHO IN AVIATION places it at your fingertips, in convenient alphabetical order. Indispensable to every NEWSPAPER . . . MAGAZINE PUBLISHER . . . AIRCRAFT MANUFACTURER . . . MANUFACTURER OF AVIATION MATERIALS . . . LIBRARY . . . AIRPORT MANAGEMENT . . . TRADE ASSOCIATION . . . CHAMBER OF COMMERCE . . . AVIATION SCHOOL . . . MILITARY SCHOOL . . . in short, it is invaluable to every organization directly or indirectly connected with aviation, whether it be in the field of production, personnel, maintenance, utilization, publication, or instruction.

FREE EXAMINATION OFFER

Verify for yourself, without any obligation, the value *Who's Who in Aviation* will have to you! We will send you your copy with our iron-clad guarantee that *if you are not entirely satisfied that here are vital statistics of aeronautics you need, you may return it within 10 days and your money will be refunded in full.*

TO SECURE YOUR COPY, FILL IN AND MAIL COUPON

Ziff-Davis Publishing Company
Book Division
540 North Michigan Avenue
Chicago, Illinois

OFFICIAL 10-DAY EXAMINATION COUPON

Please send me.....copies of WHO'S WHO IN AVIATION, 1942-43, at $5.00 per volume, on the understanding that if I am not fully satisfied, I may return them for full refund. I enclose $..... in ☐ check or ☐ money order.

Name.....
(PLEASE PRINT PLAINLY)

Address.....

City.....*State*.....

(On all orders outside of U.S.A. add 25c for packing and handling)

(*Continued from page 66*)

ufacturing facilities and improving manufacturing methods. These men have been drafted from all types of manufacturing plants, from toy makers to brassiere manufacturers. Lockheed took these men and turned their talents for co-ordinating methods and procedures into channels pertaining particularly to aircraft manufacture.

There are 12 expediters at Lockheed and these boys are the real bottleneck breakers. They have all the responsibility and authority to act as personal representatives of the works manager's office. Here's how they operate:

A directive comes in from the Air Forces commanding a modification, change or deviation in an airplane. The assistant works manager, Harvey Christen, calls in an expediter and tells him to take care of it. The expediter follows through and Christen never hears of it again until the expediter comes back and says the job is done.

The expediter, after picking up the directive (which may be a radio, wire or letter), first secures whatever work orders may be required. Next he contacts engineering. He follows up by picking up the new material piecemeal as it is engineered and carrying it to experimental planning and later to the department in which the manufacturing and assembly of the order is first started.

The expediter negotiates with all parties concerned for the exact airplane to be selected for this installation. He then follows through to completion and acceptance. The expediters have a red, white and blue tag which they may affix to a part or a plane, indicating that this part or plane has priority over everything in the factory. Only 25 of these tags may be out at one time, and to give priority to a 26th job the expediter must see that one of the other 25 is completed.

New methods, however, do not complete the story. American ingenuity and inventiveness have developed a spectacular crop of time saving devices. Latest (and one of the finest) is a new electrical "checker" which makes it possible for one man to complete in 90 minutes the electrical testing of an airplane, a job previously requiring four men and a day and a half to do.

With production at Vega being rapidly stepped up, Harry Allen, superintendent of assembly, found it necessary to speed up the electrical check-out of ships on the line. To this end, the problem of working out such a system was turned over to plant engineering. H. H. Esselstyn assigned the job of developing an instrument which could do this work to W. J. Mathieu and Phil Frankel. In a short time this "checker," entirely new to the aircraft industry, was placed in operation.

The instrument is unique in that two operations are automatically carried out simultaneously. Each of the hundreds of circuits are tested or "megged" in a single operation. Another feature, unique in aircraft testing, is that the insulation value of each circuit may be instantly determined in comparison with that of other circuits and not only to the ship's structure. Because of this feature it is readily possible to call out the exact wire identification numbers of any two circuits that may be shorted together, regardless of their location.

No specialized skill or knowledge is required to operate the new instrument. The plane's wiring plugs directly into the instrument at a centralized point in the electrical system and no further manipulation is necessary. As each test is carried out, the operator simply presses a button on the remote control box and the next circuit to be tested is selected automatically.

If the circuit is okay, a green light flashes on, but should insulation of a line be below safe standards a buzzer warns the operator. The remote control box enables the operator to move freely about the ship.

Lockheed uses a similar electrical circuit tester, designed and built by John E. Brown of plant engineering. His tester, designed especially for the Lockheed P-38 *Lightning*, checks all wires for shorts to the frame of the box and indicates by a red light those that are shorted. It also checks all plug terminals for shorts to the shell and adjacent pins, indicating by lights which are shorted and where. All switches in the switch box operate on the tester the same as in the plane, and each switch has a separate light on the test panel to indicate if it is properly wired. The entire procedure takes about 15 minutes.

One of Lockheed's most important patents is a magnetic rivet device which reduces by about one-half the riveting time on the *Lightning*. Invented by William R. Holcomb, an assistant plant superintendent, the device can be attached to the ordinary riveting gun for less than $50 and now is in general use throughout the Lockheed factory.

In recognition of his important contribution to aircraft construction, Holcomb was awarded second prize of $2,500 by the Revere Committee for one of nine inventions judged most helpful in speeding up national defense production in 1941. The invention consists of a bucking bar pulled by a wire through narrow channels inaccessible to bucking by ordinary hand methods, in conjunction with a rivet gun equipped with a magnet. As this magnet is energized by an electric current it attracts the bucking bar and holds it up against the rivet on the opposite end from the gun.

These bucking bars (commonly called "mouse bars") have built-in gauges which insure a uniformity of the upset rivet heads to meet all Air Forces specifications.

After this magnetic riveting process was developed on these difficult jobs, making possible a plane so radical in design as the P-38, it was discovered that by using the magnets and gauge bars on ordinary riveting the necessity for going through long periods of training learners could be eliminated. It has been discovered that any novice could do a perfect job of riveting when using the Holcomb device;

Rearwin Instrument Trainers Operate for Less Than $2 per Hour

This is just One of the reasons why REARWIN INSTRUMENT TRAINERS will help you make more money.

In addition, the REARWIN TRAINER is

1. A tenden model eliminating need for safety observer required in side-by-side.
2. Powered with 120 h.p. Ken-Royce engine with complete pressure lubrication which eliminates all hand greasing.
3. Quickly serviced (if necessary) by low airplane and engine parts carried in stock at the factory.

If you are not now making money with a REARWIN INSTRUMENT TRAINER, you should, by all means, investigate the unusual advantages of this superb airplane.

For immediate delivery, call or wire TODAY!

REARWIN AIRCRAFT & ENGINES, INC. Kansas City, Kansas.

Dave's Won His Wings!

Today, in ever-increasing numbers, parents swell with pride that their sons have won their wings to serve Democracy.

Behind these happy, patriotic scenes we see America's sons . . . thousands of them . . . receiving their initial flight training and going on through the advanced phases in planes powered by Lycoming, to become full-fledged military pilots.

The sturdy Navy Stearman, above, is one of many Lycoming-powered airplanes used in training Uncle Sam's pilots. Years of use, millions of miles of safe flying in these ships has proved Lycoming to be the synonym for dependability in both military and civilian aviation.

YOU CAN RELY ON

LYCOMING

AIRCRAFT ENGINES

Free literature on request showing all the various series of Lycoming radial and horizontally opposed aircraft engines and picturing many of the Lycoming-powered airplanes. Write Dept. P102.

Contractors to the U. S. Army and Navy

THE TRAINING PLANE ENGINE OF TODAY... THE PRIVATE PLANE ENGINE OF TOMORROW

LYCOMING DIVISION, THE AVIATION CORPORATION **WILLIAMSPORT, PA.**

that a man with less than a day's training can upset rivets twice as fast as a skilled operator with the regular type of riveting gun and bucket.

Ernest L. Hollenbeck of the Vega tool planning department has developed a device which simplifies the bending of tubing from 1/8 to 5/16 inch dimensions. It consists of a wood base and a metal rod with a 360° protracting dial and a protracting base, along with a six-foot flextape rule. Over-all, it is four feet long and about 10 inches high. It is claimed by Vega's superintendent of precision assembly that the Holly Hand Bend, as it is known, has cut the bending time on small tubing 50 per cent. One check of 50 tubes requiring 4 hrs. 40 min. on the wooden radius block type of bender previously in use required only 2 hrs. 15 min. on the Holly Bender. Furthermore, the old type bender was often inaccurate and many of the tubings had to be re-straightened to pattern after the bending.

The Holly Bender eliminates the marking of tubes before bending, as the flextape rule used in combination with the automatic pre-set protracting dial combine to effect a perfect job with each operation. No straightening is necessary as all bends are uniform.

Where the old type bender was hard for a woman to operate, women are used exclusively on the Hollenbeck device. A girl can be trained in less than two weeks to do production work on this machine.

For years aluminum welders have been severely handicapped by the glare from the hydrogen torches, which caused severe eyestrain and hid their work from direct view, making welding a difficult operation. This glare is caused by the low temperature at which aluminum melts, the high temperature of the hydrogen torch and the large amount of flux required in this type of welding.

This glare problem has just been solved by Dr. R. C. Burt, a member of the Lockheed plant engineering department, who, with the help of Corning Glass Works' technicians, produced a pair of goggles with the optical properties that would filter out the glare. These goggles, which are helping to speed up all welding operations in the building of P-38's and *Hudson* bombers, will be made available to all airplane manufacturers.

First trial of the new goggles was by the foreman of Lockheed's welding section. He took them off almost immediately to see why his torch had gone out, but found it burning brightly. Finally, after once more taking the goggles off, he remarked it was the first time in his life he had ever welded "without a flame."

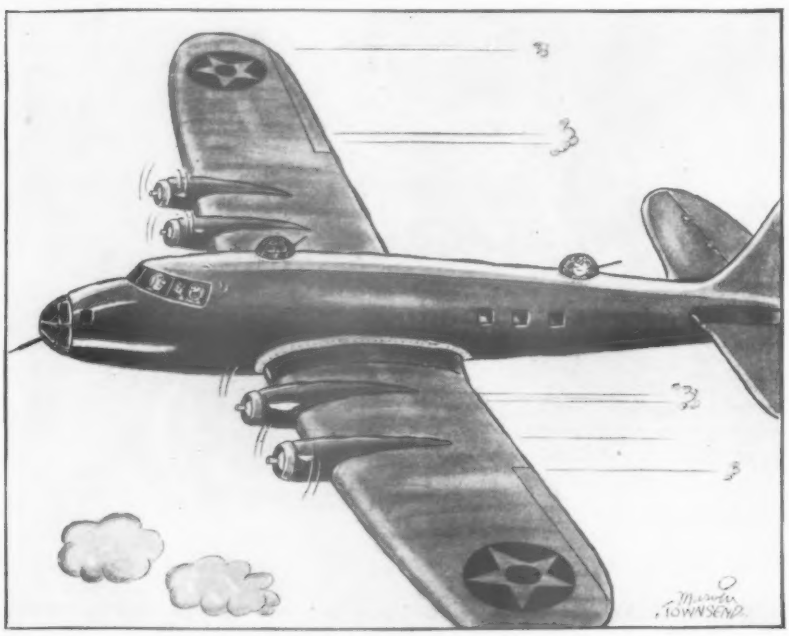
As now used by Lockheed welders, the improved lenses allow a small cone of flame to be seen at the burner tip. Not only has the welders' work speeded up but some had never been able to read or attend movies because of headache and eye fatigue until they started using the new anti-glare lenses. Now they can do both without ill effect.

When first handed the job of finding a solution to the glare problem, Dr. Burt (who already has 22 patented inventions to his credit) attempted to combat the glare by use of contrasting light fields. To prove his theory he made a welding test in full sunlight, with the expected result that the glare was scarcely visible. Next he equipped welding benches with adjustable spotlights of high local intensity. The results were excellent, but the heat from the spots was objectionable. He then tried heat-absorbing glass but encountered difficulty in finding a glass that would absorb the fierce heat without cracking. Finally, a special heat-absorbing filter which will stand the heat and transmit the desirable cold light was found and now is in general use in the plant.

While this program was in progress, Dr. Burt attacked the problem from the filtering angle. An analysis of the flame indicated the undesirable rays and then, through a series of experiments, a combination of light filters was found which not only filters out the undesirable rays but passes sufficient light of other wave lengths to give good visibility of the work.

From the absorption curve of this filter combination it was possible to select two glass filters which, combined, gave the desired results. After months of co-operative research, with Corning experts making glass samples and Dr. Burt cutting, grinding and testing, a pair of goggles was produced with all the desired optical properties.

END



"Can I invite Chadwick up front for lunch?"

Cy Caldwell

(*Continued from page 33*)

comber. And it clearly is up to the gold-braided gentlemen who direct its activities (and its inactivities) to prove that it is earning its keep. So far it hasn't done so.

Let's consider, for example, the Midway Battle last June. That was a glorious victory for American sea-air power, carrier-based, and for American land-based air power. Army, Navy, and Marine flyers sunk or damaged a quarter of a Jap invasion fleet of 80 ships. A large part of the Jap carrier power was wiped out: four carriers totaling some 75,000 tons were sent to the bottom; two heavy cruisers, three destroyers and an auxiliary were sunk. Three battleships were damaged, one severely; three heavy cruisers and one light cruiser and many transports were damaged; about 4,800 Japs were killed or drowned and an estimated 275 Jap planes were shot down or lost at sea when their carriers were sunk.

And what were our American battleships doing all this time? The Navy doesn't say. But they weren't in action there. Not one of them. Where were they? Well, apparently they were busy keeping up the old naval strategy of forming a navy "in being." That is the official term for a navy not yet sunk. It's "in being." It may not be doing anything, but it's *there*, as a threat somewhere, possibly lying off Shangri-la, that mysterious port made doubly famous by one Doolittle. (Incidentally, if Jimmy had lived up to his name he might have become an admiral commanding a fleet of battleships.) The whole theory of the employment of battleships seems to be to hang onto them, so they'll always be a threat to the enemy navy. Keep them out of danger, preferably in port, but don't lose them. That was the pre-Pearl Harbor strategy of battleship conservation, of course, about which the late Billy Mitchell had this to say in a letter dated July 10, 1928, commenting upon an article on battleships I had sent to him for his criticism:

"I notice," he wrote, "that you said nothing about these big old tubs anchored in a harbor. That is where they are really vulnerable. Our fleet has had

Dive Bomber—?

19 years of technical skill and engineering ingenuity are built into the Consolidated PBY patrol bomber . . . the Catalina.

We think she's the finest plane of her type in the world. But even with our intimate knowledge of her ruggedness and fine design, we were unprepared for a recent message that came in from "Down Under":

"Catalinas have actually engaged in dive bombing, in defiance of their designer's aims!"

. . .

Consolidated Aircraft Corporation, San Diego, California. Member, Aircraft War Production Council, Inc.

CONSOLIDATED* builds Battleships of the Air

**Originator of the LIBERATOR . . . CATALINA . . . CORONADO*

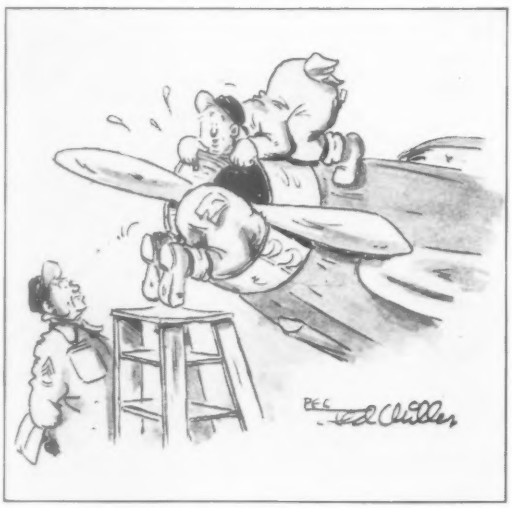
only one or two maneuvers trying to get out of a harbor in formation. When they went out of the harbor to the Hawaiian maneuvers a couple of years ago, two of them nearly sank each other in the middle of the Golden Gate. That is a pretty delicate operation to get these big lumbering tubs out in the open sea. I call to mind a statement that Admiral Von Scheer made about fleets anchoring in time of war, as follows: "They can not steam from a beginning of a war until the end at full speed, zigzagging night and day, but must anchor to overhaul machinery and to replenish their ammunition and their fuel' That would be a decisive time for aircraft to hop on them."

If Billy Mitchell had been in command at Pearl Harbor undoubtedly he would have remembered that, and the *Arizona* and the *Oklahoma* would still be afloat. But nations court-martial their Mitchells and promote their Kimmels. That is one reason why we started this war with 17 battleships and eight carriers, instead of 17 carriers and eight battleships, which would have been a more useful and realistic modern war combination. However, that is all water over the political-naval dam now, so there's no use repining. We're stuck with fewer carriers than we need, and 15 remaining battleships with which so far we've done nothing but convoy work.

Getting back to the Midway battle: The Japanese carrier force was sunk by air power, the transports were in flight; three Jap battleships were damaged, and presumably slowed down, as were three heavy cruisers and a light cruiser. There was the moment for the mighty American battle wagons, the Backbone of the Navy, to come in for the kill. There were some 60 Jap warships and transports routed and fleeing for their lives, many of them damaged. Why weren't they overtaken and wiped out? Here was no question of battleships coming up against carrier-based aviation, for the enemy carriers had been sunk. The air component of the Navy had performed its task magnificently, as had the Army Air Force. The way was clear for the dear old battleships to demonstrate the cherished naval theory that when the vulnerable carriers are lost, the stouter battleship remains master of the sea. But the battleships weren't there. They were "in being" somewhere else. They probably still are "in being" for we are seemingly disinclined to risk losing them.

Here, as off Malaya with the British warships, the evidence damns not the battleship, but a too cautious or too timid High Command that fears to risk them in battle. I'm no battleship enthusiast—I'd like to trade the lot for carriers—but as we have the things, why not use them? A bolder conception of strategy might have placed the battle fleet where it could have taken advantage of the opportunity given to it by the carrier force and the land-based planes of the Army. Meanwhile, of course, the Japs were moving into the Aleutian Islands, unopposed. So our elusive battleships weren't in the Aleutians.

In fairness to the battleships, whose cause they have so stoutly maintained all these years past, the admirals really should risk them some time, before they've lost all of our carriers. I don't know why it is that a carrier or a cruiser is apparently regarded as expendable material, while a battleship must be conserved, possibly to serve as a floating museum at the war's end. In the Coral Sea we risked and lost a carrier; at Midway another was put out of action, but not sunk. It would seem high time that the battleship came out of its corner and started to jusify its existence as a fighter. If it's too expensive to risk in battle it is merely a costly luxury. The Japs, incidentally, did risk some of their battleships at Midway, though as they got them damaged for their boldness the Jap admirals may now be proceeding as cautiously as our own. There's something about a battleship that seems to slow an admiral down.



"He's a natural . . . he used to be a dentist."

The only battleship that has really distinguished itself in this war is the German *Bismarck*, now resting at the bottom of the Atlantic, 400 miles off Brest, France. Two thousand officers and men and 400 cadets and an admiral of the fleet went down with it. Only one hundred survivors were picked up. Sending it out accompanied only by the cruiser *Prince Eugen* was an act of German boldness and audacity bordering upon madness, for these two vessels faced probable interception by the British Home Fleet, which the Germans knew included two or more aircraft carriers. In fact, it was largely air power that brought disaster to the *Bismarck*. She was located first leaving Bergen, Norway, by a British Coastal Command plane, later on was picked up by a *Catalina* flying boat, was hit once with a torpedo delivered by a plane from the aircraft carrier *Victorious* and hit twice by torpedoes from planes of the *Ark Royal*. It was one of these torpedoes that hit the *Bismarck* in the stern, smashed her rudder and probably damaged her propellers, for her speed was considerably reduced. From that moment the doom of the *Bismarck* was assured, for heavy units of the British Fleet were converging from all directions for the kill. She had been damaged previously by guns of the battleship *Prince of Wales*, during which engagement the battle cruiser *Hood* was blown up by a direct hit on the magazine, vanishing with 1,300 officers and men. Then destroyers made a night attack on the *Bismarck* with torpedoes, scoring two hits. The following day the *King George* and *Rodney* silenced the *Bismarck's* guns by shell-fire, and the cruiser *Dorsetshire* finished the warship off with torpedoes. In all, the *Bismarck* had taken seven torpedo hits, 20 hits by 15-inch shells, and some 300 hits by 8-inch shells. No ship ever had taken such a blasting before going down.

When a lone battleship can absorb such punishment, from battleships, cruisers, destroyers and torpedo planes from a whole fleet, it is obviously premature to declare that the battleship in its new, modern form is yet obsolete. Even the older and less well-protected battleships are not obsolete under certain and proper conditions for their operation. For instance, after the destruction of the Jap carrier force at Midway, any American battleships that could have contacted the fleeing and damaged Jap battle squadron should have fought an engagement with the odds in their favor. But they weren't there to fight it, so the battleship lost the decision to the airplane, simply by not being on the job at the one time when it could and should have achieved a complete victory. And if this victory had been achieved, is it reasonable to suppose that the Japanese High Command would have had the temerity to have carried out the other part of their plan to establish fighting bases on the Aleutians?

Of course, there is little doubt by now, even in the most salt-encrusted naval minds, that the aircraft carrier accompanied by cruisers and destroyers and (when possible) assisted by land-based air forces, is the major factor in naval war, especially in the Pacific. But that, surely, is no reason why these units should be the only factors, or why the battleship should retire from the war and apply for an old-age pension. In fact, the ease with which American bombers and torpedo planes sent four Jap carriers to the bottom should afford comfort to the battleship enthusiasts. Evidently the hulls of these carriers were not built to absorb much punishment in the form of torpedoes, or bombs dropped upon them or close by. Down went the carriers, leaving all of their planes not previously shot down to alight in the sea.

Battleships transformed into car-

worth fighting for!

You're darn right it's "Worth Fighting For." And it's just as sure—just as inevitable as the *Culver Victory Model* that will be announced as quick as the ink dries on the newspaper headlines. ★ So make a note that you have a date to see *Culver's Victory Model*—a cross country airplane in the low price bracket.

UNDER CONTRACT TO THE U. S. AIR CORPS

CULVER
AIRCRAFT CORPORATION
CULVER AIRPORT WICHITA KANSAS

HE might be Congressman Dow W. Harter of Ohio, Chairman of the Sub-Committee on Aviation of the House Military Affairs Committee. Congressman Harter, a regular reader of FLYING, is one of the 187 members of the United States House of Representatives (43% of them all!) who subscribe to FLYING.

FLYING

WITH AN AVERAGE NET PAID CIRCULATION OF 146,816 ABC FLYING IS THE LARGEST SELLING NON-FICTION AERONAUTICAL PUBLICATION IN THE WORLD

riers, with their armored sides and decks and their many compartments and blisters and bulges, would have a far better chance than most carriers of at least remaining afloat after severe damage. Even the older battleships should be able to absorb more punishment than the new fast carriers. And while speed in a carrier is desirable, that factor becomes of no importance if the carrier is sunk.

A battleship, like a carrier, is merely a moving platform on the sea from which a blow may be hurled at the enemy. It makes little difference whether the blow comes from a gun in the form of a shell, or comes from an airplane in the form of a bomb or torpedo. The whole problem is to deliver the blow; the method is immaterial. If the battleship is so slow that it cannot bring its guns to bear in naval action, then perhaps it is not too slow to bring airplanes into a position where they can fly on ahead and deliver the blow.

While admirals are pacing the decks of their battleships, 200 miles or perhaps 2,000 miles from where the next naval-air action is being fought, they might ponder the advisability of having the old battleship's face lifted by exchanging its guns for airplanes. It probably wouldn't be as good a carrier as one designed for the purpose, but it would stand a better chance of not being sunk than many fast carriers now in our own and other navies. In fact, it's highly probable that the new carriers being built now incorporate many of the protection features of battleships. The carrier really is an outgrowth of the cruiser. As it becomes the real backbone of the fleet (if it is not so already) it must take on more and more the characteristics of battleships so far as hull construction, deck armor and even speed is concerned.

However, the main problem as I see it is to get Admiral Pugwash's old nonbelligerent rooster into the fray somewhere. If the admirals shudder at the sacrilege of exchanging guns for airplanes, or if the naval constructors say it can't be done, I still have one more suggestion which I hope may prove helpful. There is talk of a second front being opened up somewhere in Europe, before the Russians are knocked out. The initial problem, naturally, will be to seize a bridgehead. Suppose, for instance, that the point selected for the main attack is along the Channel coast. That is a relatively small area, close to England, so we may be sure it is heavily fortified by the Germans. Now what is necessary to smash those fortifications is intensive bombing or continuous artillery fire.

The battleship admirals have that heavy fire power right now, and it's doing nothing to win the war. Why not send the battleships over there, run them into the French or Belgian coast, and simply start blasting away in artillery preparation for the invasion? The water along the channel coast of Europe is in most places quite shallow, and the bottom is sand or gravel. The battle-wagons could steam in at night until they ran gently aground, swinging broadside to the coast so all their guns would bear on the shore, where they could fire away to their heart's content, with no danger whatever of being sunk. The old theory that ships could not attack shore batteries would be disproved, for these battleships would themselves become land forts, sitting solidly and contentedly on the bottom. Even if they were damaged under water, they could easily be patched up by divers, after the bridgehead had been gained, and then they could steam off to repeat the performance at some other desirable point. In this way the battleship, in its present form, without a single change, could take an active and useful part in the war. Which, I might repeat, is more than it seems to be doing at the present time.

END

Age and the Fighter Pilot

(*Continued from page* 49)

below about age 28 to 30 who perhaps had five to seven years of flying experience or less. At the present time, however, with the limit for cadets lowered to age 18 and the college requirements no longer necessary, the great bulk of our combat pilots now are within the 20 to 30 year age bracket with the average probably about age 24. With this in view we can select this latter figure as the dividing point and class all pilots age 24 or below as "young" pilots and those age 25 or above as old(er) pilots.

Having established the limits of the two age groups and defined the terms to be used it is now possible to begin consideration of the facts and the factors which bear on the question under discussion. One of the first of these may be derived from the results of flying training.

It has been known for a long time that, on the average, the older a flying cadet is when he begins his flying training, the slower his progress in training, the less his chances of graduating, and his chances of becoming outstanding in his profession is lessened. While the chances of being washed out of flying training increases in a fairly regular manner with a cadet's increase in age, the exception to this regularity occurs, interestingly enough, at age 24-25 at which point there is a relatively marked increase of washouts.

From the above it is evident that the younger cadet has certain attributes which are helpful in learning to fly which the older cadet has, at least to some degree, lost. These attributes probably consist of greater enthusiasm for flying, greater alertness, better coordination, faster reaction time and a greater capacity to learn and retain instruction. It seems fair to assume that these same characteristics would apply to the young pilots' ability to excell in post-graduation flying training, in operational or precombat training, and in his ability to acquire a greater degree of proficiency from the lessons of combat itself.

If we accept superior training records as indicating superior fighting ability then there would seem to be little question that the young pilot should, on the

TODAY'S Harley-Davidson Motorcycles are duplicating the splendid record made by their predecessors back in World War I. The hard-riding scouts who lead the advance of armored divisions to reconnoiter, spot mines, traps and ambushes, report on road conditions and enemy movements, know that the staunch and sturdy construction of their mounts will not let them down. They know, as thousands of civilian riders know that in Harley-Davidsons *dependability* is an inbuilt quality that makes them equal to any task assigned to them.

See your Harley-Davidson dealer. Let him tell you about the superior performance of these world champion motorcycles. Also see his special values in reconditioned models.

ON AMERICA'S FRONT LINE OF ACTION

HARLEY-DAVIDSON
MOTORCYCLES

HARLEY-DAVIDSON MOTOR COMPANY,
Dept. F, Milwaukee, Wisconsin

Send FREE copy of big 24-page "Enthusiast" magazine filled with thrilling motorcycle pictures and stories. Also other literature. Stamp is enclosed for mailing cost.

Name .....

Address .....

average, be best in combat. There are other facts which bear on this question, however, which have not as yet been brought out. Let us simply grant, then, for the moment that the young pilot group has won the first round of the argument and proceed to explore the older pilot groups claim to superiority.

One indisputable fact, which the young pilot group have never been successfully able to parry, is that in World War I, and in this one also, the majority of the aces have been 25 or above and many have been 30 or over. This single bit of information is the older pilot group's main talking point and would appear to knock the younger group's argument cold. It is indeed difficult to argue against this point. However, there are contributing factors which must be taken into consideration, for it must be remembered that only age and the attributes inherent in the various age levels is being argued about and not those factors which are only incidental to age.

In order to make this latter point clear it is necessary to first review those attributes which most of the outstanding aces have been endowed with. As has already been mentioned these war aces have usually been in the older age group, i.e., from about age 25 to 32; they have had several years of pre-combat flying experience, they have been close students of flying and of combat and practised every phase of their profession ceaselessly, they have been cold and calculating by nature and possessed of good judgment, they have had the good sense and moral courage to run when their chances of success were hopeless and thus lived to fight another day and add to their victories. Finally they have been precise flyers, deadly shots and relatively fearless.

How many of these factors can be credited to age and how many to other circumstances? It is generally agreed that good judgment, common sense and moral courage are attributes of age. On the other hand flying experience, experience in aerial gunnery, and fearlessness are not. Experience in such things as flying is a matter of circumstance. For example a cadet who enters flying training at 18 can not accumulate five years of flying experience by the time he is 21, simply because he is not allowed to start training at an earlier age. Also, it is an accepted biologic fact that fearlessness is less common in older men than in younger ones since it is natural to become more conservative and cautious with age.

From this analysis two new arguments might be put forth. One of these is that the proven excellence of the older group is due to their experience and in spite of their age. A second is that since fearlessness is not a natural attribute of age, that those who do possess this in the older group are the exception rather than the rule. Whether these latter points are valid or not the fact remains that most aces are over 24 years of age and as the second round of this argument comes to a close it can not be decided other than overwhelmingly in favor of the older group.

For the third and final round of the argument, a number of miscellaneous facts will be reviewed which may influence the final decision. First of all it must be noted that the number of aces in both the last World War and in this one, as compared to the number of pilots involved, has been very small. Taking Germany, England and Italy for example—countries which have had thoustands of pilots engaged in aerial operations for almost three years now—how many outstanding aces have resulted? The answer is: comparatively few. Assuming that all of the aces were in the older age group it is evident that age *per se* is not in itself a guarantee of combat excellence but is simply one of many influencing factors. At the same time it must not be forgotten that the young pilots also have their aces. They also, as a group, have contributed a large number of victories which, however, have been distributed in small numbers among their members and these have been unattended by publicity of the sort attracted to individual acts of heroism in aerial combat.

". . . Six, seven, eight. Yep, they're all there."

The reason for this latter is fairly evident. In modern operations there is little individual combat and missions are normally carried out by elements, flights or squadrons. The leader is the highest ranking and thus generally the older member of the unit which influences the distribution of victories by reason of the fact that the ranking officer leads the attack and assigns certain of the junior members of the force to cover his unit's rear. These latter in such cases have little opportunity to achieve personal victories the while they are making victory possible for others.

There is one other very important factor which has not as yet been discussed but which deserves emphasis because it is of considerable importance. This is the question of certain advantageous natural biologic attributes of youth as opposed to those of age.

As has been noted previously, the young trainee learns to fly more readily than the older one. This, as has been stated, is due partly to the faster learning rate in young men, partly to the fact that they are better co-ordinated and react more quickly, and to this may be added the fact that they have considerably more "dash." This latter term is one frequently used to describe the attributes of the youthful flyer. It covers a multitude of characteristics and implies such things as enthusiasm, recklessness, daring and impulsiveness. Such characteristics are not wholly to the good in combat but taken by and large they are highly desirable. While the natural attributes of the younger pilot normally result in a higher proportion of them suffering defeat as a result of their comparative lack of judgment and caution the enemy suffers the consequences of their slashing tactics. Where the younger pilot loves to fly the older one perhaps simply likes to fly; where the younger pilot goes into combat hell-for-leather, the older one tends to use discretion and thus may hesitate; where the younger pilot may get a thrill out of combat the older pilot must normally utilize courage; and where the younger pilot may pile in without a thought of the consequences the older pilot tends to consider the situation and measure his chances carefully.

Because of his lack of caution it may be said that the younger pilot is less influenced by danger. In any case, fearlessness is a myth, for such probably does not exist in an individual who has sense enough to learn to fly. Courage, it must be remembered, is not a lack of fear but the ability to carry on in the face of danger. The younger man's advantage is largely due to the fact that he is more apt to get a thrill from the hazards involved than is the older man. Such a reaction to fear is not so difficult to endure for it implies being frightened and enjoying it. Fear, when counteracted by courage alone, saps one's moral fiber and may eventually exhaust it completely.

A final evaluation of all of the factors mentioned above can lead to no clear-cut conclusion but it is probably fair to say that if 500 pilots age 24 or below were pitted against 500 pilots age 25 and above—each group having identical training, flying equipment, etc.—the result would be pretty close to a draw. A larger number of aces would emerge from the older group but a greater proportion of the remainder would probably be knocked down, not so much by aces in the younger group but by the num-

CLAS

The
Telegr
gram
formed
dicate
errors
collec

The Sta

C
T
G

P
A
A
T
T

S

WESTERN UNION

CLASS OF SERVICE
This is a full-rate Telegram or Cable-gram unless its de-ferred character is in-dicated by a suitable symbol above or pre-ceding the address.

A. N. WILLIAMS, PRESIDENT
NEWCOMB CARLTON, CHAIRMAN OF THE BOARD
J. C. WILLEVER, FIRST VICE-PRESIDENT

SYMBOLS
DL = Day Letter
NT = Overnight Telegram
LC = Deferred Cable
NLT = Cable Night Letter
Blue = Radiogram

The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

BUFFALO NEWYORK.

COL. CLAIRE L. CHENNAULT=
THE OFFICERS AND GROUND CREWS OF THE AMERICAN VOLUNTEER
GROUP. VIA: U. S. DEPARTMENT OF STATE.

PLEASE ACCEPT OUR SINCERE CONGRATULATIONS AND OUR
APPRECIATION FOR THE MAGNIFICENT MANNER IN WHICH THE
AMERICAN VOLUNTEER GROUP HAS PERFORMED. YOUR SUCCESSFUL
ENDEAVORS IN THE FACE OF OVER-WHELMING ODDS HAVE
DEMONSTRATED CONCLUSIVELY THAT ONLY VICTORY CAN LIE AT
THE END OF THE ROAD. WE ARE PROUD OF THE PERFORMANCE THE
CURTISS PLANES YOU USED IN COMBAT HAVE SHOWN AND PLEDGE
OUR EVERY EFFORT TO IMPROVE DESIGN, PERFORMANCE AND
PRODUCTION THAT THE UNITED STATES ARMY AIR FORCE OF
WHICH YOU HAVE NOW BECOME A PART WILL BE ASSURED THE
FINEST FIGHTING AIRCRAFT IT IS POSSIBLE TO CONCEIVE.=
THE EMPLOYEES AND MANAGEMENT CURTISS-WRIGHT
CORPORATION AIRPLANE DIVISION BUFFALO, NEWYORK.

CURTISS-WRIGHT SALUTES THE *Flying Tigers*

The exploits of the American Volunteer Group in destroying superior numbers of Japanese invaders in Burma and China are now epic. Today Curtiss P-40's of still greater fighting ability are helping to make America's Air Forces invincible on every world front.

CURTISS-WRIGHT
Corporation
AIRPLANE DIVISION

Curtiss-Wright
FIRST
Since the Birth of Aviation

1923-First Army Hawk, 420 h.p. Flown by Lt. R. L. Maughan in first coast-to-coast, dawn-to-dusk flight—150 m.p.h.

1929-Six years of development finds this P-6 Hawk with greater horsepower—625—and many improvements.

1937-Retractable landing gear (a 1933 development on the Navy Hawks), a speed of over 300 m.p.h., a 1100-H.P. engine, were among the notable advances on the P-36 series.

1943-Since the production of the original P-40's, this famous series has undergone four successive "step-ups" to new high performance levels in speed, ceiling and striking power.

SECOND PRINTING! Send 10¢ for **your** copy of this fascinating 96-page history of aviation by Assen Jordanoff, author of "Your Wings", with illustrations of current fighting types. Airplane Division, Curtiss-Wright Corporation, Buffalo, N. Y.

Bell Airacobras Respond to Dawn Alarm

Take-off
WITHOUT TRUMPETS

Charging down the runway with throttle wide and tail in air an Army Airacobra quickly pushes down the earth—then rises high above the clouds on call to duty.

No trumpets blare—no banners fly as squadrons of these fast and agile fighters of the sky ascend to battle. Yet, dramatic as it seems and is, it is the daily routine of Army Pilots.

And just as Airacobras climb swiftly skyward, so has the Bell Aircraft Corporation that builds them—without fanfare or ostentation—climbed swiftly into mass-production.

Working day and night, without pattern or precedent in an infant industry, ingenuity and engineering skill were severely taxed to perform "impossible" tasks. New production methods had to be devised—parts and assemblies designed as well as the tools and equipment that were required to produce them.

Then came the building of an organization—the gathering together of thousands of men and women, strangers to each other—unskilled in the work they were about to do—yet eager for the tasks at hand.

Training—intensive training—was the order of the day, training in the handling of machines and tools, training that would form the habits and customs of a new-born industry.

How well this job has been done is indicated by the rising and fighting power of Airacobra Squadrons in our fighting forces and from the high praise that comes back from fighting fronts. © Bell Aircraft Corporation, Buffalo, New York.

Airacobras for victory—

FUTURE PLANES FOR PEACE

BELL *Aircraft*

PACEMAKER OF AVIATION PROGRESS

ber who would slam into the combat and either hurt somebody or themselves get hurt.

And so the argument ends—as far as we are concerned. If we personally were looking for a single individual to do a tough job of aerial fighting we would look among the older group. If we were looking for a *group* to do a tough job of aerial fighting we think the younger bunch could perhaps do it better. One or more of the older group leading a pack of the youngsters would obviously be best and is the method used in our forces to obtain the brilliant results which have already brought dismay to the enemy and honor to our airmen—both old and young.

It is hoped that the impartial presentation of the facts in this matter will assist in stilling one of the oldest arguments amongst the members of our air forces. The authors were much encouraged by the complete agreement reached by a member of each of the two groups to whom the manuscript of this article was read. The only disconcerting note was occasioned by the voice of the older pilot, floating back up the stairway to our office after the discussion, as he snorted:

"You young squirt! I can lick the pants off you anyway."

END

Maintenance

(*Continued from page* 55)

story (which they took with a grain of salt), accepted any suggestions and adjustments and promptly forgot the whole thing until the ship came in for another periodic a year later. All over the country other mechanics were doing the same thing. When they reported to the factory some talked to the sales department, some to the production department and once in a while someone got to the service department. But there were seldom enough complaints to any one department to make the factory think that the failing was other than isolated service troubles.

A little over a year ago, with the rapid increase in the CPTP, when it was evident that operators were going to put more time on a plane in a year than the manufacturer had anticipated in the life of the plane, it became apparent that there was going to be a need for some supervision different from any ever attempted in aviation; supervision to keep the planes in the air safely. In the short time allotted, hard-working private flying specialists and superintendents scoured the country for men trained in servicing private planes of the types being used in the anticipated program. These men were specialists in the repair field, either operators of repair stations or mechanics in charge of large private operations. Each was recommended for his judgment and experience.

These men were sent to Washington where they were given special training and were familiarized with Government procedure and routine. They discussed problems they had encountered in their work and made notes on the troubles that other mechanics had found and which they had not encountered. After a month of this intensified training they were sent out to their own districts with orders to check every plane in that district once a month and get them up to a standard where they were safe to fly at all times.

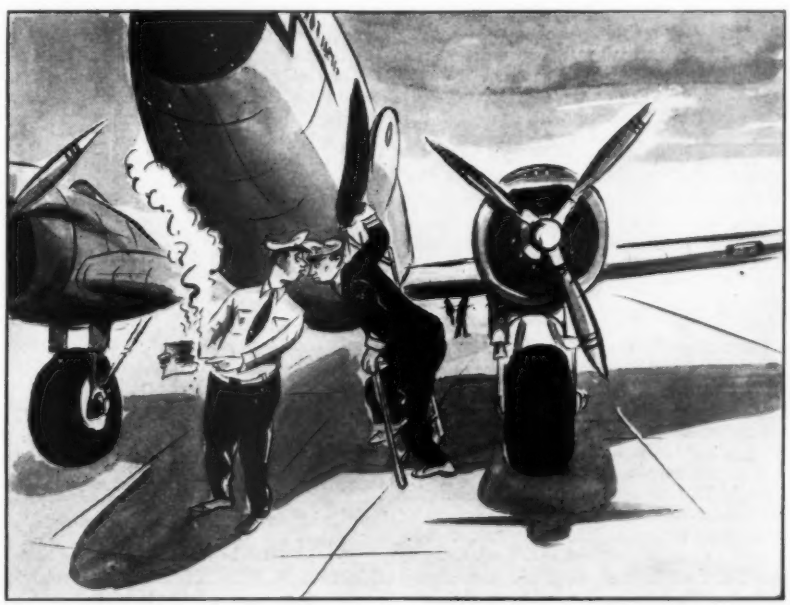
This was a big job. The work was new, the pilots and operators were used to having their ships inspected once a year and thought that they were being imposed on in some cases. The one redeeming feature of this system that contributed more toward its success than any other factor was the fact that the men doing the inspecting were from the field and 30 days previous had been doing this same work and had been as resentful to constant supervision even though the inspections were made only once a year at that time. They knew when a mechanic told them he had done all possible to inspect a ship and see that it was in good order he was telling the truth. They then ran an inspection themselves and often found parts on the ships that were on the point of failure or in some cases had failed and weakened the structure around them. They didn't get after the mechanic and ask for revocation of his certificate. They showed him the trouble, showed him the cause and how to correct it. Then, more important than the correcting of the fault itself, they wrote a complete report on the difficulty found and, through their regional offices, forwarded it to Washington where it was copied into bulletins and sent on to other maintenance supervisors all over the country. With all supervisors having a continual flow of this information at their disposal it was easy to be of real service to the operators in the field. It was easy to show them where they were missing a bet on the inspection of their equipment and teach them the right methods of inspecting a plane.

At the start of the program a plane with 1,000 hours was expected to be in a pretty worn out condition and generally run down. Today there are planes with 2,500 hours' flying time that are in first class condition and good for hundreds of more safe flying hours. Operators are making money on maintenance for the first time because by constant supervision and inspection each job is a small one and big jobs never accumulate. Accidents still occur; but look at the figures released by the Safety Board for a year ago and today and note the drop in the accidents caused by engine or structural failure. This decrease is due to constant maintenance and supervision. Untold numbers of accidents have been prevented by repairing parts that were on the point of failure or strengthening a part that had failed for other operators.

Today more than at any other time we need competent mechanics and helpers. We cannot train them in the short time allotted so we will have to show them the simple principles of mechanics and then furnish the information as to failures, etc., so that they will be able to make up for lack of training with a surplus of information available for their use as the occasion arises.

No more inspections will be made in the flight office with a pen. No friends will sign your log-book and say your plane is in good condition because you said you looked at it. Planes are going to be inspected. Fittings will be cleaned so that they can be gone over closely. Holes will be cut to look at the parts which are hidden. Operators and owners have found out that it is cheaper to put new bolts in the landing gear, control hinges and cable ends every 100 hours than to put on a new gear or control surface every 500 hours.

It is cheaper to lay a ship up and let the mechanic give it a complete going over until he has looked at every part and corrected every defect or weakness than



"Shh! Weather O.K. to El Paso."

to rush the ship out before it is ready and then have the defects grow or become so numerous that the ship is finally grounded for a complete major and recover.

Usually a problem of this kind is either satisfactory for the large operator or for the small operator but seldom for both. It has been proven that in the case of preventative maintenance the small operator and the large operator both find that their maintenance problems are small when they adopt a strict inspection policy and practice preventative maintenance.

Now that the country is at war it is hard to get parts. Delivery on new parts is often slow and ties up operations so it is absolutely necessary that every operator take care of the parts that he now has and do everything in his power to prevent wear as much as possible. Replace bushings when they start to wear and save the control surfaces or pulleys. Keep oil off the fabric. Accumulated oils and dirt are a fire hazard and rot the fabric. Inspect control cables every 100 hours and look for worn as well as frayed cables. A shiny spot indicates that the cable is rubbing more than it should and if you can eliminate that spot of wear you will prolong the life of the cable.

Inspect welds carefully, inspect engine mounts and axles. A failure of a tube or a weld can occur in one day's flying and this is not unusual, but by proper inspection you will find some indication that the part is starting to fail before the actual failure starts. Beware of cracked paint and chipped spots. They are often a direct indication of the start of a failure.

Due to the increased hours propeller hubs have been giving trouble lately. Hubs have cracked on the rear flange between the lighting holes. This cracking is mainly due to failure of the mechanic responsible for the inspection of the plane to see that the front plate is tight on the hub. If this front plate is not snug and the propeller is not a tight fit there will be a flexing of the propeller that will cause the rear flange to crystallize and develop fatigue cracks. If these cracks are not caught the entire rear flange will fail and the propeller will come off in flight. A few minutes of preventative maintenance will eliminate this danger entirely if the front flange is kept plated so that the fit is good on the main hub, and if the hub bolts and propeller nuts are kept tight. Remember that wood shrinks with pressure and with temperature. Prevent propeller troubles by inspecting attaching bolts at every engine check.

Don't neglect the exhaust heaters on your plants. Too often the mechanic looks at the tag on the side of the heater and decides that a 20-hour inspection is not necessary. The chances are that your heater may be in good condition, but let's look at the results that we may expect if it isn't. The exhaust pipe passes through the heater and the hot air from the exhaust pipe is forced into the cabin of the ship. In most ships there is a tendency to pipe this heat to the feet of the pilot since he is responsible for the safe handling of the plane and should have as much comfort as possible. If a crack develops in the manifold the exhaust gases are going to escape into the heater and be forced into the cabin directly at the pilot. Except for a slight burning of the eyes the pilot is unaware that there is a leak in the system and continues to try and fly. This will become difficult as the contents of the cabin become more and more saturated with the carbon monoxide. A very short time under this condition will produce unconsciousness and the probable results will be a serious accident with the loss of pilot and aircraft. This is an expensive price to pay for the savings obtained by eliminating the inspection of the exhaust heater. This inspection would have disclosed the condition and prevented the accident.

Magnaflux and similar methods of inspecting for hidden defects have become important factors in preventative maintenance. It now is considered a standard practice among good operators to have all steel engine parts inspected at each major overhaul by the magnaflux method to expose any cracks or defects that may be developing in the metal due to the loads and vibration to which it has been subjected. Why wouldn't it be good maintenance to go a step farther and have the propeller hubs inspected by this method and at the time of dismantling for a major overhaul or after an accident, why not magnaflux the wing fittings and strut adjustment screws? The expense of this is small and the satisfaction of knowing that the parts are in good condition should more than offset this cost. One cracked fitting discovered in time may save several thousand dollars.

Pilots too must help in this job of preventing undue wear by using care in the handling of their planes and engines. Don't rev the engine when it is cold and don't taxi with unnecessary speed. Above all, remember that there are more than two positions for the throttle and handle it sensibly in the air as well as on the ground.

If the mechanics and pilots will study the maintenance manuals provided by the manufacturer and follow instructions for the operation and maintenance of that engine, its life should be unlimited. Airplanes also will last indefinitely if they are maintained properly and get the proper treatment from the pilots.

Your duty as a mechanic and operator during this period when the country needs every plane and pilot for its defense is to prevent the sabotage of dirt and carelessness by constant, thorough inspections.

"Keep 'Em Flying" by investigating accidents before they happen.

END

Stanton Confirmed

PRESIDENT ROOSEVELT'S appointment of Charles I. Stanton as Administrator of the Civil Aeronautics Administration has been confirmed by the Senate.

Hinckley to Sperry

ROBERT H. HINCKLEY, former Assistant Secretary of Commerce for Air, has become assistant to the president of the Sperry Corporation.

Women Workers Wanted

(*Continued from page 34*)

by men, and it's not hard to figure that there'll be plenty of work for women as well as men in the aircraft plants of this country after the war is over.

Airplane manufacture is today our fastest growing industry and from several angles it is one of the best industrial fields for women.

For one thing, you don't have to be a Powerful Katinka to work in an aircraft plant. In fact, lack of weight and size is often desirable. A half-pint size worker fits better (literally!) in a job to be done inside the wings or the nose than does a mighty-muscled Tarzan. And a featherweight can beat a heavyweight any day when it comes to skipping over the fuselage or performing other feats in the class with the Man on the Flying Trapeze.

Then take wages—and the women are taking just the same wages the men take. Better ones, too, than most of them would have taken in one of the more usual occupations for women. One California plant reports that the average wage for all types of work done by women at that plants is 71c an hour. That's not peanuts, especially when you line it up beside the 44½c an hour these same women were earning in previous occupations.

Age limits don't mean much in the aircraft industry, either. True, they don't want girls under 18 years. But on the other side of the picture they don't consider you on the shelf just because you've reached the age where you don't tell it any more! In fact, even though you spend your Sundays in a rocking chair with a grandchild on your lap, you can spend your weekdays on a fuselage with a rivet gun in your hand—if you want to, and if you show an aptitude for that kind of work.

Besides all these advantages, the aircraft industry offers women more opportunities for jobs than any other industry except the automotive. Estimates made by various aircraft plants as to the number of operations women can perform satisfactorily vary from 20 per cent to 60 per cent. In Great Britain the percentage of jobs now being done by women is around 40 per cent; but those who know about such things prophesy that by the end of the war a much larger percentage of aircraft production will be in the hands of women.

It has been estimated that President Roosevelt's goal of 125,000 warplanes in 1943 may require a total labor force of far more than 1,000,000 men and women workers.

If you want still more figures, actually there are almost 900 production jobs in aircraft manufacture which are suitable for women, to say nothing of the hundred or more clerical or other non-production jobs available. If you think those figures are exaggerated, you can verify them by checking with the occupational survey recently made by the Occupational Analysis Section of the U. S. Employment Service of the Social Security Board. This survey also shows that over one-third of these jobs can be learned in

less than two months and that in approximately two-thirds of them a worker can be trained in six months or less.

This, of course, is another reason why aircraft production is so well suited to women. No long periods of expensive, technical training are required to fit yourself for most of the work. Many of the plants, in fact, have already established schools within the plants themselves where training for better jobs and more difficult work is being given to women now working on some of the simpler operations. So if, one fine day, you suddenly decide to chuck the dishes out of the window and get away from it all, your nearest aircraft plant will doubtless be glad to take you on and start you training for the dimpling machine or as a snag grinder or rivet flunky—any of which will take you not over two months to learn.

Rookies are usually started on sorting or machine testing of small parts or are put to work sewing covers for rudders, ailerons, wing tabs and other control surfaces. From there they go on to learn riveting, running drill presses, filing, removing metal burrs from machined parts, and to light assembly work on wings, fuselages, etc.

Some of the machine jobs on which it is figured women will prove to be most successful include drilling, reaming, countersinking on single, multiple and pneumatic drills; small milling machines, small turret lathes, small and medium size punch presses, small angle bending machines and brakes, light grinders, riveting and dimpling machines, spot welding.

As bench workers they could be responsible for burring and filing of all kinds, soldering, hand forming over templates and blocks; tube cutting, bending and assembly; electrical assemblies, wiring and bending; sub assemblies in jigs and at benches.

They're also expected to be particularly expert at stretching covers on plane surfaces, applying dope and paint and decals, spraying small parts, stenciling and doing masking and touching up.

All this, of course, represents a tremendous advance over conditions of only a year ago. Up to July, 1941, practically no women were employed in the aircraft industry except as clerical employees, sewers and upholsterers. Last November it was estimated that approximately 3,000 women were employed. By December another 1,000 had been added and around 600 more were working in airplane engine plants.

In May of this year one eastern aircraft plant was employing women at the rate of 300 a week and already had 3,000 on its payroll. By the end of this summer it is figured that at least 5,000 will have been hired in this eastern area.

Estimates of the number of women who will be employed by the end of 1942, run into almost fabulous figures which change every day as the need becomes more evident. For most of the men in the aircraft industry come within the draft age and are being drawn rapidly into the armed forces. Women, of course, will have to be employed to fill their places.

One Pennsylvania plant anticipates hiring at least 2,500 women. A Southern California plant believes that eventually two-thirds of its workers will be women. In fact, so rapid has been the growth of the need for women workers in California, that permission has now been given to employ women for the third shift of the 24-hour day (called there "the MacArthur shift"), from 11 p.m. to 6 a.m.

Plants in California, Washington, Texas, Virginia, Kansas, Missouri, New York, Connecticut—they are all hiring, or planning to hire, women to replace their dwindling supply of men. In Kansas, aircraft plants are refusing to employ men between 20 and 35 years of age who have a 1-A classification. In California a plant which refuses to hire men between 18 and 28 is taking on women of 18 to 40 (a short time ago they had an 18-35 age limit).

One of the questions which women and girls are always asking when they contemplate going into aircraft production work is: "What kind of an education or background do you have to have to get in?" The answer is, "Almost anything goes—if you have the manipulative skill, the temperament and the native intelligence needed in such work." Aptitude tests will soon discover whether or not you have.

Girls from high schools, trade schools and vocational schools are working side by side with college graduates. Women from the farm are paired with women from metropolitan cities. Girls with previous factory experience of some sort are particularly welcome, but in one West Coast area they estimate that well over 100,000 women will have stepped right out of the kitchen onto the production line before the year is up.

On the average, so one plant has found, women workers are 27½ years old, three out of every four are married. As this was written, this same plant was employing women in every manufacturing department except the foundry and hammer shop, the pattern shop and the center wing assembly department. Perhaps, even as you read, the Hand That Rocks the Cradle will have invaded those sacrosanct precincts.

Another natural question from prospective bomber builders is: "What chance of advancement will I have without former technical training? Will I just be stuck on the same job for the duration?"

The answer to that is up to yourself. If you're ambitious and show an aptitude for the work, in most plants you'll be given a chance to take special training for new work while working at your regular job. Then, as fast as your skill warrants, you'll be promoted. As a matter of fact, the plants themselves are just as anxious to push you up the ladder as you are to climb. If you go up, into a harder job that a man has formerly held, it releases that man for a still more difficult job or for service with the country's armed forces.

Actually work in aircraft plants is not a brand new occupation for women, though many of the individual occupations which they are now performing are new. At the close of World War I, 23 per cent of the employees in 40 airplane factories were women, more by far than the

YOUR COUNTRY needs AIRPLANE DRAFTSMEN!

New I. C. S. Course, Studied in Spare Time, Prepares YOU for SUCCESS in This Growing Field!

TODAY, more than ever, America is air-minded! Probably no industry offers greater opportunities to the *trained man* than aviation. New airplane designs are the order of the day. Millions are being spent for military aircraft.

To produce the drawings for these new airplanes, thousands of draftsmen and engineers are required. Every airplane company now needs a large force of *trained draftsmen*. And because the aviation industry is expanding so rapidly, unusual opportunities for rapid advancement exist—*for the trained man only!*

How YOU Can Get Training—Now! To enable you to prepare yourself for success in this branch of aviation, the International Correspondence Schools (whose graduates include the president of a major airline and hundreds of other successful aviation men) now offer a newly prepared course in Airplane Drafting.

This course not only gives basic training in "math," mechanics, strength of materials and drafting needed by the successful draftsman—but also instruction in subjects of particular value in drafting rooms where airplanes are designed. Students are familiarized with airplanes and their parts. Aviation terms are clearly defined. Illustrations are numerous and easily understood. Elementary Aerodynamics is included.

Study in Your Own Home. I. C. S. students study at home—don't need to give up their present jobs. No "classroom slow-pokes" hold you back. *And the cost of sound, modern I. C. S. training is surprisingly low!*

This coupon, *mailed today*, will bring you a FREE BOOKLET—"AVIATION OPPORTUNITIES"—and complete information without obligation. Do it now!

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 5843-D, Scranton, Penna.

Please send my free copy of "Aviation Opportunities," and complete information on the course marked:

- ☐ AIR PILOT
- ☐ AVIATION MECHANIC
- ☐ AIRPLANE MAINTENANCE
- ☐ AVIATION ENGINES
- ☐ AVIATOR
- ☐ AIRPLANE DRAFTING
- ☐ FUNDAMENTALS OF AERONAUTICAL ENGINEERING

Name.....*Age*.....

Address.....

City.....*State*.....

percentage at the beginning of this war despite the terrific growth in the industry over the past 24 years.

But even World War I was not the first contribution of women to the cause of war in the air. Way back in the last century during the Franco-Prussian war, it was the French women who sewed together the fabric which made the balloons which formed the only means of communication between the beleaguered city of Paris and their military forces out beyond the besieging German lines.

What the percentage of feminine workers in aircraft plants will be when Victory Day comes to the United States can only be guessed at—and your guess is as good as mine. American women have always proved, however, that what they *have* to do, or what they *want* to do, they *can* do. If they have to take over in those jobs not now considered suitable for them—drop hammer operators, power hammer operators, sand blasters, steel heat treaters and a few others which require considerable physical strength—then they'll do it.

END

Superman

ACCORDING to an Air Force News Letter, the Army has a specialized version of exactly what a flight surgeon is. To those physicians desiring to become flight surgeons, certain qualifications are required. He first must be a combination of Superman, Tarzan and Flash Gordon. He must be a man of vision and ambition, a before and after dinner guzzler, a night owl, work all day and all night and appear fresh the next morning.

He must be a man's man, a ladies' man, a model husband, a plutocrat, a democrat, a technocrat, a New Dealer, an Old Dealer, and a Fast Dealer; a technician, electrician, mathematician, machinist and ambidextrous.

He must be a promotion expert, create a demand for his services, be a good correspondent, attend all meetings, tournaments, funerals and births, visit flyers in hospitals and jails once a week, and in his spare time do missionary work.

He must be married, single or divorced, with unlimited endurance and frequent over-indulgence in wine, wind and gab; must have a wide range of telephone numbers in all principal cities and villages for cross-country purposes.

He must have an attractive home (a tent will do), belong to all clubs, pay all expenses at home and cross-countries and one-third of what his associates have, payable when Congress chooses to give it to him.

He must be an expert talker, liar, dancer, traveler, bridge player, etc.

Victory Weld

(*Continued from page 46*)

arc, and which feeds helium through the torch to the weld. Helium has over five times the specific heat of air and when in motion prevents heat accumulation around the weld, thereby keeping it cooler and giving a better fusion with less distortion than other welding processes.

This heliarc welding torch is the secret of this revolutionary welding process. Welding in a helium atmosphere has been accomplished before; in fact the Northrop engineers tried and discarded several methods of using this gas before they hit on the idea of feeding the helium shield directly through the nozzle of the torch. But all other methods proved faulty in some respect and none of them had been applied to the welding of magnesium.

This exciting new welding process is the direct result of over two years of research by V. H. Pavlecka, chief of research; Russ Meredith, welding engineer and Thomas E. Piper, process engineer and metallurgist. Piper and Meredith stoutly maintain that Pavlecka deserves all the credit. Pavlecka just as stoutly states that he merely asked for a means of fastening magnesium so that he could build an entire airplane out of it. According to him, his two experts merely filled the order.

In 1939, when Pavlecka got the idea of designing to magnesium rather than aluminum alloys, the country's greatest experts on magnesium told him it couldn't be welded. Piper and Meredith agreed with Pavlecka that experts had been wrong before and could be again so they started experimenting. Jack Northrop had just formed his own company, which at that time was quartered in the ancient Hawthorne Hotel, and he backed his men to the limit.

Side by side with a secret project—later revealed as the Northrop flying wing—the experiments on heliarc welding started and now, more than two years later, when it is sorely needed by the aircraft industry, is perfected and ready for use.

Already the industry is turning to this new tool, not only for magnesium welding but for experimental work with many other metals. In Northrop's experimental division a regular crew of welders is working with this new process under regular production conditions on a highly secret and very intriguing project. Reports from this work show heliarc welding to be one of the easiest methods yet devised. Quickly trained welders—many of them women—can do expert work with the heliarc torch. This writer, with no instruction, picked up a torch for the first time in his life and welded a six inch lap joint between two sheets of magnesium. The weld was firm and perfect from end to end, although naturally a little rough.

In the laboratory at the time, an engineer was experimenting with a piece of beryllium copper alloy, welding with a stainless steel rod. It was one of several metals he had tried to take care of an urgent request from a far off trouble spot in America's war effort. He was confident that heliarc welding would be the answer to the problem before many hours had passed and Tom Piper showing us around, grinned at the youngster's enthusiasm and agreed that this torch would undoubtedly do the job.

A Book That Should Be Read By Everyone Whose Goal Is American Air Supremacy . . . The Story Of The Contribution Of Aviation's Greatest Benefactor, And The Foundation, Progress And Destiny Of U. S. Aeronautical Science.

Pitman Publishing Corporation Proudly Presents

"AMERICA FLEDGES WINGS

THE HISTORY OF THE DANIEL GUGGENHEIM FUND FOR THE PROMOTION OF AERONAUTICS"

by

REGINALD M. CLEVELAND

De Luxe Executive Edition

Limited Quantity Available

$4.50 per copy

WRITE

Pitman Publishing Corporation, 2 West 45th St., New York, N. Y.

Northrop engineers will tell you that the welded airplane is the airplane of the future. That's why they've worked so hard and so successfully on welding processes. They point to the mortality among riveted tanks in Libya and call attention to the switch to welded tanks. They perfected a spot-welding process for aluminum to do away with much unnecessary riveting on the production line. Heliarc welding was perfected to allow them to use magnesium as a primary metal in airplane construction. As Piper puts it: "we can build a magnesium wing with almost no stiffening inside. It will be lighter, just as strong, easier to build and a lot smoother than a riveted aluminum wing." He also says that it is now possible to build a whole airplane out of magnesium, and since it can be done, Northrop will probably be doing it one of these days.

Pavlecka, Piper and Meredith are just a bunch of practical, American scientists doing their research in a factory, but this country has plenty more like them and the Axis gang is going to be mighty sorry it tangled with them and the planes they're designing and building.

END

Japs

(*Continued from page 42*)

vehemence, absurd though it may seem to us.

There is no question in my mind that the Japanese were building up an air force against a necessity for major war. For it is quite unbelievable that they could go on flying the comparatively inadequate planes that we saw over Chinese territory, and then suddenly out of the blue could produce their Navy Zero fighters and Mitsubishi navy bombers. These must have been built up over a period of time and after careful experiment, to the point at which we first saw them over Malaya.

I remember saying to the air marshal commanding the British air forces that my recent trip to Thailand (and what I had heard there) had finally convinced me that the Japanese had at least three or four squadrons of very fast planes of, possibly, the Messerschmitt type, either Me-109 or Me-110. And I added that my information indicated that the Thais had during the past two months enlarged the runways of their two airports nearest to the Malayan frontier.

This turned out to be true, for on the outbreak of war on December 7, Japanese planes hopped off from their bases in Indo-China, landed on Thai air bases, refueled there and then proceeded to blast hell out of our frontier and the adjacent landing grounds.

The trouble of course lay in the fact that we had not over 200 planes of all types to cover some 15 air bases scattered all over the Malay peninsula and island of Singapore. The medley of Vickers *Vildebeest* torpedo planes, early Bristol *Blenheim* bombers, and Brewster *Buffalo* fighters, was not calculated to inspire confidence in the minds of our air force.

It was simply a case of doing the best

THESE VITAL AVIATION VOLUMES

Should Be Within Easy Reach In Every Aviation Plant!

Pitman's Famous Aviation Books

A dependable Reference Source for Plant Officials —Designers—Engineers and Draftsmen who are keeping pace with every important development in the Aviation Industry.

COVERING a wide range . . . from new work in Plastics—Wood—Aircraft Diesels—through to such basic subjects as Aeronautical Meteorology, these volumes will perform a vital service in every Aviation Plant. They represent a complete cross-section of the latest developments in materials, techniques and methods.

Widely used in thousands of Aviation Training Centers—written by authoritative authors whose names are by-words throughout the Industry, these Pitman Books are in active service in hundreds of progressive Aviation Plants throughout the United States and Canada.

10. Experimental Aerodynamics

by Henry Christensen Pavlan. 171 pgs., 80 ill. $2.50
"Professor Pavlan has written a book in simple language in which he describes the fundamentals of his subject clearly." . . . "For many years there has been a distinct need for a book of this sort; it fills a gap in aeronautical literature."

14. Aircraft Materials and Processes

by George F. Titterton. 360 pgs., illus. $3.50
At this time of national emergency, the book has been carefully revised to include the latest materials and processes.

15. Airplane Design Manual

by Frederick K. Teichmann. 350 pgs., 170 ill. $4.50
"The author is to be complimented on a fine piece of work. His text is remarkably complete; his tables exhaustive. It is so well written and so complete that it may well serve for self instruction."

16. Aircraft Radio and Electrical Equipment

by Howard K. Morgan. 384 pgs., 215 ill. $4.50
Here is a book written to provide clear understanding of the operation and use of present-day equipment, and beyond that to enable the reader to keep up with the developments which are already clearly forecast.

17. Aeronautical Meteorology

by George F. Taylor, Ph.D. 444 pgs., illus. $4.50
"No factor in safe flight is more important than knowledge of existing weather conditions and knowledge of probable trends."

18. Automotive Engine Testing

by Foster M. Gruber. 447 pgs., 238 ill. $4.75
Today's most usable, up-to-date information based on practical experience in engine testing, backed by careful research and investigation.

19. Aircraft Diesels

by Paul H. Wilkinson. 286 pgs., 160 ill. $6.00
The long-awaited book for the aircraft industry. Contains much exclusive data and numerous photographs brought back from Europe just before the outbreak of the European War. The accomplishments in Germany and the increasing interest in the United States are described in detail. An excellent technical report.

25. Analytical Design of High Speed Internal Combustion Engines

by F. M. Cousins. 240 pgs. Charts, diagrams....$3.50
Hitherto unavailable and widely scattered information on this significant phase of design is concisely and graphically presented in this one well-organized book, essential to designing engineers.

26. Industrial Plastics

by Herbert R. Simonds. 394 pgs., 160 ill. $4.50
"The enormous progress made in plastics during the past few years seems truly to demand just such a comprehensive and yet compact volume."

27. Metal Aircraft Construction

by Marcus Langley. 443 pgs., illus. $5.00
British and American practice in construction and fabrication operations of metal airplanes. Good treatment of wing and fuselage construction and subsidiary structures. Basic operations such as welding and riveting receive treatment also.

30. Modern Plywood

by Thomas D. Perry. 380 pgs., 195 ill. $4.50
The only comprehensive, up-to-date picture of the manufacture and use of this modern versatile material.

31. Wood Technology

by Harry Donald Tiemann, M.E., M.F. 326 pgs., 129 ill. $3.50
The author has for over thirty-five years been in government research with wood under the Forest Service. His research and invention were of strategic value to the United States during World War I, the army having adopted as standard his method of kiln drying gunstocks and airplane parts.

Order Now! **For individual books write in book number on coupon and mail. For the entire group—order on Plant Stationery.**

For Complete Pitman Aviation Book List check "Into the Wind."

Indicate C.O.D. or enclose remittance!

PITMAN
PUBLISHING CORPORATION
2 West 45th Street, New York, N. Y.

IN CANADA: SIR ISAAC PITMAN & SONS, LTD., 381-383 CHURCH STREET, TORONTO

PITMAN PUBLISHING CORPORATION
2 West 45th St. F-11
New York, N. Y.

Please send me book(s) No(s).....
.....
Name .....
Address .....
City and State.....
I enclose Money Order ☐ Check ☐
Send C.O.D. ☐ Send "Into The Wind" ☐

we could with what we had got. And the Japanese combination of Messerschmitts, Navy *Zeros*, and Mitsubishi bombers, plus some unidentified dive bombers, proved much too strong for our air force or ground defense. In the first place we had very few Bofors guns available at the beginning of the struggle, particularly on the bases near the frontier. And there were no 3.7 batteries posted north of Kuala Lumpur as far as I am aware. However there were a number of them in use later in the southern provinces and on the island of Singapore itself, and they did a very fine job of work indeed.

At the commencement of the campaign the Japanese concentrated on the task of knocking out our forward air bases, and did it very successfully, for by the third day they had captured or eliminated the four landing grounds nearest to the frontier. With only Lewis guns and perhaps a dozen Brewster *Buffaloes* in action it was impossible to hold these positions. On two or three occasions

Vintage of 1933, the Vickers "Vildebeest" still was in use by the British in the Malayan campaign. Its 620 h.p. engine gave it a top speed of 141. It carried two guns.

when I was there the Japanese would bomb us from 5,000 feet or so, and then dive down and fly round the field machine-gunning anything that moved.

There was from 70 to 100 m.p.h. difference in the speed of the American-built *Buffalo* and the Japanese *Zero* and the result was inevitable. For a time the very best RAF pilots, by their superior skill and courage managed to hold their own and shoot down a few Japs, but their end was inevitable and it was a tragic thing that so many fine fighters should have had to sacrifice their lives to such small purpose.

The same thing applied in the Dutch Indies and Borneo, where the Dutch flyers, who were highly skilled, having been trained for years on the civilian K.N.I.L.M. and other runs, had also to fight in Brewsters in a losing battle. The whole thing was one of those minor tragedies of warfare, for these planes were built on a contract signed with the French government, and when Vichy laid down on the job and the Allies were shouting for planes in every direction, these Brewsters were thrown on the market and taken over by the British and Dutch in the Far East for want of anything more modern being available.

It is an interesting point as to how far the Germans were responsible for the rapid advance of the Japanese air force, for there is no question that there were Nazi pilots amongst them. In fact, two or three were actually shot down over Malaya, according to our reports, though I personally did not see one. But I did see a white officer in field grey (and presumably German) who climbed out of a Japanese tank and escaped down the road during the campaign in the south of Malaya.

To return to a consideration of Japanese aerial strategy. After they had flattened our forward air bases their bombers and fighters turned their attention to railway stations and sidings, where their bombing was fairly accurate but not very destructive. Mostly small stuff was used, 50 and 100-pounders in the main, with 250-pounders in some of the towns. They used to dive-bomb and machine-gun the roads pretty consistently, making a trip to the front quite a little adventure. As it was impossible to hear their plane engines when driving, we used to put a dollar each in the "kitty" and each take a window of the car. The one who spotted a "diver" first got the pool when we returned to the car later from the shelter of the nearest ditch.

Our antiaircraft defenses in Singapore kept the Japanese bombers pretty high, but they used to come over several times a day at about 15,000 to 18,000 feet and have a little quiet fun. You could time your movements pretty well by them, as a matter of fact. Finishing breakfast by 8:30 o'clock you could reach headquarters nicely by nine in time for the first raid at 9:30, then you could emerge from any shelter that you had fancied, usually a shop or ditch by the side of the road, and continue with any errands you had on hand. Remembering, of course, to be near some sort of shelter by about eleven o'clock for the next raid, and then to arrange your lunch so as to miss the raid due some time between 12:30 and one o'clock.

Curiously enough, they were using only 50- and 100-pounders on the city (without much success), but they put down 500-pounders on the airports, with the result that the surfaces were destroyed several times a day. This led to an unforeseen problem, for the native labor had mostly bolted into the jungle after the first raids, with the result that there was no one to do any resurfacing work. There were no mechanical graders or shovels or other machines, so our island airports became mostly unusable, either for taking off or landing, as there was no possibility of obtaining white people to carry out the necessary repairs.

There was one interesting point which cropped up during the fighting in both Malaya and Burma, and that was the question of aerial communications. The Japanese were using a very light field wireless set with which they could contact their air force, and whenever they ran up against opposition in the shape of machine-gun nests, etc., they would send out a call for help in Japanese, which practically obviated the necessity for the use of any code and, within 15 or 20 minutes, Japanese dive bombers would show up and blast any opposition out of the way. This occurred on so many occasions where road blocks, tank obstacles, artillery positions and nests of machine-guns were concerned that it became most discouraging. It was really a brilliant example of the value of co-operation between infantry and air force.

It was not until we were pushed back to Batavia that *Flying Fortresses* came into the picture, and as the more modern type with rear turrets came into action they were impervious to attack by Japanese *Zeros*. I was surprised, as a matter of fact, that the latter could follow us up to the 20,000-foot level at which the *Flying Fortresses* were mostly operating.

One factor which afforded me some satisfaction was the construction of the *Zeros*, which were of fabric and wood, without armor for protection of the pilot. They were equipped with only four guns (as far as I know), and any sort of a hit seemed to be enough to wreck them. But of course the lightness in construction was an essential which led to increased speed and lower fuel consumption. Added to which they carried a supplementary gas tank in plastic material, which gave them an extra 250-mile range, as compared to the Allied planes which lacked these extra tanks.

Another point worth noting is the fatalistic outlook of the Japanese pilots, who deem it their greatest honor to die for the emperor and push their torpedo and dive-bombing attacks home to the verge of suicide. I was told by gunnery officers of the *Prince of Wales* and the *Repulse* that when these ships put up a barrage which in the Atlantic and Mediterranean fighting had been more than enough to turn away any Nazi attack, the Japanese completely ignored it and kept on coming.

But taken all in all, and given equal material, there is no doubt in my mind that the American and British flyers are superior to the Japanese, and if we can only hold them until our production begins to tell, there is no doubt as to the final result.

END

It's Done with Mirrors

(*Continued from page 28*)

associates was not the invention of this device, but its development to a point where its efficiency was increased greatly. Before Burrell and his fellow workers undertook the project, the Army had in use a photo observer which took a limited number of exposures of only a few instruments.

Burrell talked with Ben Rudnick, Republic's photochemist. "If I can get more than the 36 exposures per flight that the Army gets, we can expedite testing," he remarked.

Rudnick's first move was to change the 35 mm. film to 16 mm., or one quarter the size of the former.

"You've got a board about 20 inches by 20," the experts said. "In addition, you're trying to photograph a bunch of very small needles. How are you going to catch all this on a piece of film slightly larger than a man's thumbnail?"

Burrell and Rudnick didn't catch it at first. Thirteen may be unlucky for some, but it was fortunate for them, for the 13th lens they tried—a wide angle lens with a consequent short focal length—eliminated much of the blur.

With the new lens the whole board showed, but the needles were indistinct. The resolving power, or ability of 16 mm. to pick up the needles and marking points on instruments, was exceeded. This was overcome by film processing. The resolving power was broken down by under-exposing and over-developing, thus bleaching out the tiny particles of silver that are in film. Recent advances, though, do away with the necessity of utilizing this process.

Like much magic, it's "done with mirrors." On the XP-43 the apparatus was installed in the baggage compartment and the camera took a direct picture. For the sake of convenience and because of scarcity of available space in the belly of the P-47 *(Thunderbolt)*, present production job high altitude fighter, a mirror system was devised. Whereas formerly the distance between the lens and the panel might be as much as five feet, depending on the size of the panel used, the present method "covers" the whole board with the camera placed a scant 18 inches away from the object.

This distance was cut through the adaptation of an idea launched in the projection room. If you can imagine yourself getting up out of a chair in a movie theater and climbing up on the stage to see your current favorite go through some heavy amatory maneuvers, you have an idea of what Republic engineers had to do in the projection room. They had to set the projection machine, get out of their chairs, walk 15 feet to the screen and then, recording books in hand, jot down the instrument readings. Then walk back and repeat.

Rudnick devised a clever solution for this—by giving light a run-around. Under the method he developed (see diagram) the projected figure is routed back, through use of mirrors, to within

Become an Instrument Technician...

...and Take Off for *New Heights* in Aviation

The Altimeter

...indicates the altitude or elevation of an aircraft. It is one of the most important of the flight instruments. There are two types, the "service altimeter" and "sensitive altimeter." A Sensitive Altimeter—shown above—indicates with great accuracy through highly sensitive reaction to variations in atmospheric pressure. Its maintenance requires technical knowledge and craftsmanship of the highest order.

The "altitude" that YOU reach in aviation as an instrument technician depends only on grasping the wealth of opportunities open to you NOW, for important, good-paying positions... and in the future, for gratifying advancement, achievement, and success.

Possessing the highly specialized skill and technical knowledge of the trained instrument technician you have the choice of many good positions with airlines, aircraft builders, and instrument manufacturers, and at Army and Navy aircraft maintenance depots as a Civil Service employee. Key positions and executive posts await you SOON...if you will only make your start NOW.

Instrument technicians are vital to our nation's victory in this "war in the air"...and equally vital to the vast future development of aviation. YOU WIN with A.S.A.I. instrument training... in war and peace alike.

A. S. A. I. Graduates "Gain Altitude" Fast

Kenneth G., 1940 graduate, now chief of instrument department, Pan American Airways overseas maintenance base—Harry M., 1940 graduate, in charge of Link Trainer instruction, Western Air Lines—Robert S., 1940 graduate, in charge of instrument mechanic training at large Air Corps maintenance depot—Robert O., 1941 graduate, instructor, Sperry Gyroscope Co.'s aeronautical school—Herbert L., 1941 graduate, Sperry Gyropilot inspector, Air Corps maintenance depot—John M., 1942 graduate, government inspector, Kollsman Instrument Division of Square D Company—John L., 1941 graduate, in charge of Sperry Shop, Pan American Airways base, New York City.

Civil Aeronautics Administration approved repair station No.1028 ★ Contractor to U.S. Army Air Corps ★ 6 month course qualifies graduates for U.S. Civil Service appointment

FOR COMPLETE INFORMATION on instrument opportunities and training **SEND COUPON NOW**

AMERICAN SCHOOL of AIRCRAFT INSTRUMENTS

Oldest and Largest Aircraft Instrument School in America

AMERICAN SCHOOL OF AIRCRAFT INSTRUMENTS

Dept. F-10
3903 SAN FERNANDO ROAD
GLENDALE (Los Angeles County)
CALIFORNIA

Please send complete information on aircraft instrument careers and on your specialized training courses.

Name_____ Age_____

Address_____

City_____ State_____ F-10

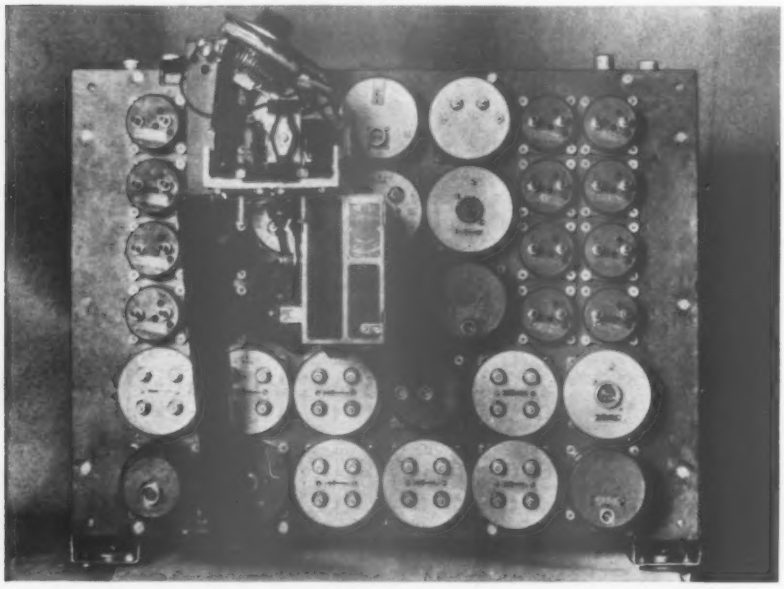
arm's length of its starting point. An engineer can run the machine and take notations without leaving his place.

Use of the mirrors resulted in a "ghost" image. That is, there was a multiple of pictures projected on the screen at the end of the mirror journey. This was conquered by silvering the mirrors on the surface rather than on the back.

Where much space was required between the camera and the panel in the plane, the whole unit now consists of a box, usually 20 inches square at the largest point but varying somewhat in size, depending on the number of instruments needed for a test. It can hold as many as 42 instruments. Some of these are dual, so that actually as many as 60 readings can be made simultaneously. An example of a dual instrument is one which records the temperatures of two cylinder heads. Another may record the free temperature and the carbureter temperature.

Many are the recordings which can be taken to help engineers study minutely every part of a *Thunderbolt*. Most of the photo observer instruments are those not normally found on the instrument board of an airplane. About the only duplications on the two boards are air speed indicators, altimeters, engine tachometers and manifold pressure gauges. The photo observer continues far beyond this, getting such data as turbo-supercharger speeds, spark plug temperatures, oil temperature, baggage compartment pressure, temperatures at the various cylinder bases and heads, temperatures of the exhaust gases at the waste gates, air flow pressure through ducts. It even measures the amount of pressure a pilot must use to move the stick.

The device itself is rather unprepossessing in appearance. The average instrument panel is 20 inches square and tapers down at the sides to another panel about three and one-half inches square. At Republic, these boxes are made from scrap aluminum. The instruments are fitted into holes in the larger panel (or back) of the box, with the dials and gauges facing the smaller or tapered end. At the smaller panel is a mirror, which reflects the faces of the instruments. A camera is inserted in the middle of the large panel, with the lens pointing toward the mirror. Two fluorescent bulbs light the inside of the device. Green gives the best results. Part of the equipment is an inverter, used to produce a 150-volt alternating current from a 24-volt battery. A 120-volt A.C. current is required for the fluorescent lighting, with the extra voltage providing a margin of safety and performance.



Looking at the back of the photo observer, the installation of the motion picture camera can be seen in detail. A 60-to-1 gear ratio is used to slow down the camera.

One of the bigger problems which had to be overcome was the mounting of the photo observer so that the delicate camera mechanism would not be jarred. This finally was solved by use of Lord rubber mountings, so that no part of the device comes in contact with any metal except that of the wiring.

Camera trouble was the main thing that had to be overcome. Regular motion picture cameras couldn't stand the vibration. Patience and replacement, more than anything else, brought about the answer to this problem. Any time a part gave way, Republic machinists turned out a duplicate part, except that it was manufactured of stronger material. Again the assembly would be installed in the ship, and while the craft and the camera were put through the paces, Burrell and others would cross their fingers and wonder what would break next.

The cameras, originally spring driven, are operated and rewound by the same electric motors. A 60-to-1 gear ratio is used to slow down the camera. A triple gear, with variable speeds, controls the exposures, which usually are set for one frame a second, a far cry from the 36 per flight of former days. Up to 100 feet of film can be exposed before reloading is necessary, with each foot catching 40 frames.

There also is a method by which a pilot may draw attention to a specific second during a flight which may see him hurtling along at terrific speed. Should he suspect that his air speed indicator is incorrect, or that some other cockpit panel instrument reading is wrong and needs checking, he presses a button. When he does, a light flashes. This flash shows later when the film is run through the projector, and draws the attention of engineers to the specific moment.

William Brown, who has taken over development of this equipment since Burrell's death, has added two valuable ideas of his own. Last winter a pilot put a *Thunderbolt* through its test maneuvers. When the film was developed, it showed only a few low-altitude exposures, with the rest of the flight blank. Time and gasoline had been consumed. After several weeks of experimenting, Brown came forward with a signal light attachment which now prevents such occurrences. The signal light, installed in the cockpit, operates from the camera motor, and flashes continuously while the camera is in operation. Brown also developed a counting device, attached to the camera gear, which tells the pilot how many exposures have been made.

END

French Aviation

(*Continued from page* 48)

mercial plane but it could have been converted for military use in less than two days. Wibault says all commercial planes designed at the arsenal at that time were planned with such conversion in mind.

The subject of parachute troops brought a grim smile to Wibault's face. When Guy La Chambre took over the air ministry in 1938, he dismissed parachute troops on the ground that they were a "Soviet inspiration", and ordered that the men be returned to the infantry.

The Air-Wibault, largest transport in Europe at that time and 82 per cent completed before the fall of France, had several unusual technical features. By cutting down on the number of rivets used, much time and money can be saved. For the Air-Wibault, M. Wibault designed a hollow wing which permitted easy installation of rivets (see cut), Wibault also perfected an engine mount enabling an engine to be installed in 3½ minutes. Oil and gas lines and electric control cables all were cut off automatically; the four bolt attachment of the engine (see cut) explains this speed.

Another important plane designed at the arsenal was the wooden fighter known as the "Arsenal". This was a single-seater with a ceiling of almost 40,-

EQUIPMENT SUPPLIED BY WEEMS SYSTEM OF NAVIGATION

1. WSN Speed-Time-Distance Calculator.
2. Navigation Note Book & Plotter, *Weems.*
3. Aircraft Plotter, Mark II.
4. Simplified Celestial Navigation, *Weems and Link.*
5. Air Navigation Outline, *Keator.*
6. Line of Position Book, *Weems.*
7. Illyne Star Chart, with booklet.
8. Air Almanac, for 4 months.
9. Radius of Action of Aircraft, *Tornich.*
10. Marine Sextant.
11. Second-Setting Watch.
12. Marine Navigation, *Weems.*
13. Link Averaging Bubble Sextant.
14. Instrument Flying, *Weems and Zweng.*
15. WSN Course and Distance Protractor.
16. Air Navigation, *Weems.*
17. Star Altitude Curves, *Weems,* per 10° Lat. Band.

Write to: Weems System of Navigation, Annapolis, Maryland

U. S. Looks Ahead - - to 4000 hp. Engines
SERIOUS SHORTAGE OF ENGINE MECHANICS
Aero Tech's Answer
AIRCRAFT ENGINE TRAINING IN ONLY 16 WEEKS
Warplane Engine Production Soars to a Record Hi
Acres for U.S. Airplane Engines

THOUSANDS OF OPENINGS IN 9 DIFFERENT BRANCHES OF AVIATION

1—Airline maintenance bases. 2—Civilian Pilot Training Schools. 3—Civilian schools training U.S. Army Aviation Cadets. 4—Army and Navy aircraft maintenance depots and bases (Civil Service positions). 5—Aircraft plants (engine inspection, installation, and pre-flight and after-flight checks). 6—Aircraft manufacturers' customers' service departments. 7—Foreign service aircraft maintenance bases of airlines and aircraft manufacturers. 8—Aircraft engine and engine parts and accessories sales work. 9—Aircraft engine manufacturers (engine production, inspection, and testing).

Here is your outstanding opportunity in all Aviation . . . if you want to get into the industry quickly . . . if you want the finest training . . . if you want a starting job that offers fast advancement, ever-widening opportunity, and a lifetime career . . . if you want to serve your country throughout this war in a really important capacity.

Leading aviation authorities have stated publicly, including testimony before Congress, that there is a dangerous shortage of aircraft engine mechanics . . . that the number of trained engine mechanics has lagged far behind aircraft production and the training of our fighting airmen.

Because we must strengthen this link in the great chain of personnel and planes making up our nation's air power, *Aero Tech* has created a 16 weeks Aircraft Engine Course. Through this special course *Aero Tech* will send many well-trained men into this vitally important branch of both commercial and military aviation. It is only because of this emergency situation that *Aero Tech* has varied from its long standing policy of longer courses.

You are trained in *Aero Tech's* superbly equipped shops, on the big, powerful engines used in our most famous fighting planes. You learn inspection, servicing, repair, overhaul, and installation . . . also induction, fuel, and electrical systems . . . and many other phases of engine mechanic duties. When graduated you are ready to step into one of the many enviable positions listed at the left. Get complete information on this unusual opportunity and training by sending the coupon AIRMAIL *NOW.*

THIS WAR AND YOUR FUTURE

Get this FREE booklet

It answers the many questions bound to be in your mind about how to serve your country best, and still plan a secure, successful future in aviation after the war. For your free copy, send the coupon NOW.

AIRMAIL this coupon NOW

Aero Industries Technical Institute
5255 West San Fernando Road, Los Angeles, California

Please send complete information on the Aero Tech 16 week Aircraft Engine Course, and my free copy of the booklet. (If interested in Aeronautical Engineering instead, check here ☐).

Name_____

Address_____ Age_____

City_____ State_____ A-58-PA

Contractor to U.S. Army Air Forces Technical Training Command

6 Career Courses in AIRCRAFT MECHANICS, AIRCRAFT ENGINES, and AERONAUTICAL ENGINEERING—including CAA-approved 12 Month Aircraft and Engine Mechanics Course

AERO TECH

AERO INDUSTRIES TECHNICAL INSTITUTE

5255 WEST SAN FERNANDO ROAD, LOS ANGELES, CALIFORNIA

000 ft., a speed of 580 km. (360 m.p.h.) and a range of 800 miles. It carried four machine guns and a 20 mm. cannon. Wibault became particularly interested in wooden aircraft because of the increasing difficulty of obtaining metals. With all due respect to plastics, said Wibault, "when there's no time to cook them", plywood and wood treated with casein will do as well.

Toward the end of 1939 every piano and furniture factory in France was producing plane parts.

"The fighter plane is ammunition", Wibault says. It should not be built with the durability of a transport, which is expected to last some 10 years. Wibault estimates that the present life of a fighter is about 200-300 hours (in 1914-18 the Germans gave a military plane two hours and 32 minutes, Wibault said.

The arsenal also produced a fighter specifically designed to contend with the Messerschmitt Me-110. This plane had twin Hispano engines of 1,200 h.p. each and was expected to have a top speed of 400 m.p.h. This fighter carried five 20 mm. cannon: two in the nose, two in the engines and one in the rear turret. In addition it carried four machine guns.

According to Wibault, production of fighters was running about 700 a month early in 1940, but lack of good engines remained the greatest drawback. Water-cooled 860 h.p. Hispanos were the most commonly used, but this was by no means enough power for the modern designs. The French engine industry was in the hands of Gnome-Rhone and Hispano-Suiza.

In 1937 the Air Ministry sent Wibault to the United States to negotiate for a license to manufacture one type of American engine. But when Guy La Chambre took over, he immediately stopped all production of the American engine—largely out of personal spite towards Pierre Cot, said Wibault.

The entire question of France's unpreparedness in the air can be boiled down to one cause—refusal to face facts. The place of the airplane in the military future was forcefully pointed out by men like Wibault, but complacency, political jealousies and sheer lack of imagination blocked the way.

Michel Wibault, 45 years old, a slight, grey-eyed, grey-haired man of inexhaustible energy, now is developing new designs for the United Nations. Like all aviation men, Wibault believes the cargo plane is the ship of the present and he hopes to contribute to the speed and economy of their production.

END

Warning to Pilots

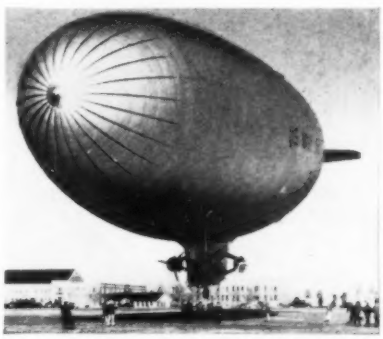
THE Civil Aeronautics Board has issued warning that failure on the part of pilots to read airport bulletin boards daily may prove fatal. New danger areas are established from time to time and violation of such areas may result in the offending plane being challenged by anti-aircraft fire, as has already happened. Gun crews protecting such closed areas are under orders to shoot down any civil aircraft flying over their territory.

Blimps

(*Continued from page 25*)

The working day is longer during this phase. The cadet "hits the deck" at 5:30 in the morning. His class marches to the flying field for 30 minutes of vigorous calisthenics. This succeeds in driving the last bit of sleep from droopy lids and puts an edge on the appetite for 6:30 breakfast.

The training class then musters at 8 o'clock for ground school work. Here the cadet faces a stiff study course designed to give him basic technical foundations for flight and mental discipline. Cadets keep classroom notes which are turned in at the end of the ground school course, which covers aerostatics; airmanship; free balloons; lifting and fuel gases; ship maintenance; ground handling and mooring; power plants; aerology; navigation; instruments; ordnance and gunnery; strategy, tactics and mission; communications and parachutes.



This is a K-type Naval patrol blimp.

A final examination in the practical aspects of all subjects is given at the end of the course.

Morning classes are over at 11:30 o'clock. Spare time is scarce during this training period, so the cadet makes every minute count. He has half an hour before noon mess. There is laundry to be sent out, letters to write, stamps to buy and even a quick haircut from the station barber can sometimes be worked in at this time.

From 1 o'clock until 4:30, the cadet is back in the class room. There is another free half hour before 5 o'clock evening mess.

Classroom work for the day is finished after another two-hour period from 5:30 until 7:30. A two-hour study period follows, with lights out at 9:30.

Flight days follow approximately the same time schedule, except that breakfast is quicker. The class must be on the flying field by 7:30 to launch the blimps.

Flight schedules will have been made out the day before. The first crew up stand by with the instructor. The motors of several training ships in the giant hangar warm up with a confined roar. A grinding noise rises above the roaring motors and a silver of light cuts through the hangar's end as the tremendous doors slide apart.

"All set?" asks the instructor. "All hands aboard."

They walk over to the nearest training blimp and one by one climb up the little metal ladder into the gondola.

All the ships have their noses snubbed to mobile mooring masts. The ground crew is standing by, holding the guy-ropes and taking off the anchor blocks that help hold the ship secure when moored.

The officer in charge of the ground crew signals, and a small yellow tractor backs up to the mast, fastens its tow bar in a coupling. The instructor, who now is in the pilot's seat, waves a signal and the tractor slowly pulls the mast and ship through the hangar doors. The guy-ropes are taut, the handling crew alert against any sudden gust of wind that would whip the gas-filled bag out of control. At first glance, these blimps might seem as cumbersome as a 10-ton truck, yet they must be handled with extreme care when launching and landing. A sudden puff of wind against those thousands of cubic feet of helium could make the ship act like an agitated gold fish.

Once on the field, the tractor heads the blimp into the wind. The mast is unfastened from the ship's nose and the tractor drags it away.

The cadet is about to see the practical application of his classroom problems. He has studied the ship's construction, knows what makes it fly. The text book explained the instruments and how to navigate by them. Now he is to be an actual part of the ship. He feels the controls, the elevator wheel and the rudder wheel.

As one instructor said, "Anyone can fly a blimp once it's in the air." The important phase of flight training is the launching and landing of lighter-than-air craft. This is part of the training that must be grasped with the student at the controls, hence the cadet will find much of his primary flight training time spent in landing and taking off.

The instructor once more goes over the details of the control system. The ground crew is braced against the tugging ship. The pilot adjusts the controls, guns the motors. The big bag begins to move and gather speed. The ground crew release the guy lines while running. The pilot moves the wheel and the ship slowly noses up and into the air.

Weather conditions may present hazards in both launching and landing. Care must be taken not to come in too fast. The cadet must be able to judge his landing speed as he approaches the ground. It must be slow enough for the handling crew to grab the trailing ropes and secure the ship for mooring.

Primary flight training is conducted with the "L" type blimp, which was introduced to thousands during peacetime as an advertising medium flying over cities and carrying passengers.

From 60 to 100 hours' flying time are required in the "L" type before the cadet soloes and progresses to advanced flight training. Included in this flight time are free balloon flights, usually five daylight flights of two or three hours' duration with many intermediate landings and ascensions, and one night flight.

The purpose of these balloon flights is to give the cadet a knowledge of static control of an airship. The need for this is explained by the fact that if the motors of his blimp were to fail during flight, his ship would then be the equivalent of a free balloon. Also, there is no better way to learn aerology, meteorology and air currents than from the giant wicker basket of a free balloon.

After the cadet successfully completes his ground school and primary flight time, he enters advanced flight training.

The transition is twofold. He leaves the small "L" type trainer for the larger patrol type "K" ship, and he now has collateral duties. Not only does he pilot the ship, but he also must collaborate on beam flying, instrument flying, contact problems and navigation.

Flight time in advanced training accumulates quickly, since the cadets are crew members on the long anti-submarine patrol flights. However, the problems of launching and landing are accented in the larger, heavier patrol ships, and the cadet must become proficient in every phase of operations.

After he has successfully completed 150 hours in advanced flight training and mastered the intricacies of the larger ships, he is commissioned ensign A-V(S) USNR, designated a Naval aviator (airship) and is qualified to wear the coveted gold wings.

Those wings are now appearing in ever increasing numbers. Pilot training at Lakehurst is 100 per cent above the figure for last December. Many of the 48 authorized patrol ships have been delivered. Delivery dates on the others is near.

Realizing the tremendous strides taken by lighter-than-air and its importance in coastal patrol, the House Naval Affairs Committee has recommended that Congress increase their number to 72.

This is good news. It's good news to those captains and deck hands on merchantmen and tankers who wave a welcome hello to every passing patrol blimp. It's good news to plain John Citizen who knows that more blimps mean fewer subs.

END

Flight Strip Completed

THE first emergency landing strip, capable of handling the biggest bombers, has been completed at an unrevealed location on the Atlantic seaboard. Paved with 8-inch concrete, the strip is 8,000 by 500 feet, with a hard surface 7,000 by 150 feet. It is the first in a $10,000,000 program authorized by Congress.

Canadian "Helldivers"

FAIRCHILD AIRCRAFT, LTD., Longueuil, Quebec, has been licensed to build large quantities of the Curtiss *Helldiver*. The mid-wing two-place *Helldiver* is designed for land and carrier-based operations.

Serve Dextrose Candy

DEXTROSE candy in malted milk and lemon flavors now is being served TWA passengers in lieu of other refreshments as a means of conserving space otherwise occupied by ordinary food items.

Letters

RAF Issue

Sirs:

I have been requested by the Permanent Under-Secretary of State for Air to convey to you the warm thanks of the Air Ministry . . . and to express also their admiration of the excellence of the issue.

W. C. G. CRIBBETT
Assistant Secretary
British Air Ministry
Royal Air Force Delegation
Washington, D. C.

Sirs:

I should like . . . to congratulate you on . . . the special RAF number. It is a splendid production and will be of great service.

COL. SIR VIVIAN GABRIEL
British Air Commission
Washington, D. C.

Sirs:

. . . It is an excellent number and I shall keep it among my books.

JAMES FORRESTAL
The Under Secretary of the Navy
Washington, D. C.

Sirs:

. . . Allow me to congratulate you on the splendid issue. . . . You have done a remarkable piece of work and have presented us with a real historical document.

JOHN H. FREDERICK
Professor of Transportation
and Industry
University of Texas
Austin, Tex.

Sirs:

I am pleased to have this copy. It looks interesting indeed.

JOHN L. COLLYER
President,
The B. F. Goodrich Company.
Akron, O.

Sirs:

. . . I have leafed this issue and am looking forward to reading it from cover to cover in a few days. It promises to have a wealth of information about this very interesting current subject. I would like also to congratulate you on the excellent way it is gotten up and on the fine pictures it contains.

JOHN W. THOMAS
Chairman,
The Firestone Tire and Rubber Co.
Akron, O.

Sirs:

. . . I would like to . . . congratulate you on your publication, and this issue in particular. The RAF issue will not only be of great interest to your readers

(*Continued on page* 114)

Air Mail Everywhere

(*Continued from page* 29)

The importance of overseas air communications to the British Commonwealth in time of war, and the part that would be played by the "merchant service of the air," as air transport is becoming known, was not sufficiently realized before the war. Because of this Great Britain has suffered from a shortage of transport airplanes. Some of the flying boats and landplanes of British Airways were taken over by the RAF at the beginning of the war and, although these have mostly been returned, the corporation has been called on to increase and extend its air routes and duties to such an extent that, with its comparatively small fleet of airplanes, every pound of weight in every available machine has been invaluable. Also, the amount of payload available has been reduced because of the longer stages which have had to be flown on the wartime routes.

One of the first changes made by the war was the suspension of the all-up Empire Air Mail Scheme, first introduced in 1937, whereby all first class mail was sent by air at the rate of about three cents per one-half oz. Air mails are still accepted for some countries at 25 cents per one-half oz. But, because of the lack of flying equipment, they have to be sent part of the way by ship. Because of this, air mail to the Middle East takes about seven weeks and ordinary mail about 11 weeks.

This method was slow and expensive and, as the British military forces in the Middle East increased, faster and cheaper postal communications became necessary. The introduction of the airgraph solved the problem as this method takes only about 10 days in actual transit. Any delays in delivery are usually because of the distance from headquarters of the units to which the letters are addressed.

At first the airgraph service could only be from the Middle East to Great Britain, but by August, 1941, the equipment for enlarging and printing airgraphs had arrived in the Middle East together with a technical staff from the Kodak organization, and the outward service from Great Britain began on August 15.

By November the service had been extended in both directions to Aden and Iraq; by February this year an inward service from India was operating; and in the middle of March an airgraph service, already working in the outward direction, was introduced from East Africa. Outward services to India will be started as soon as the equipment needed for enlarging and printing the letters can be delivered from the United States. With more Recordak equipment and a larger fleet of transport airplanes, the airgraph services might be extended throughout the Empire.

The service has, to a certain extent, become the wartime version of the Empire Air Mail Scheme. Instead of three

There's an Important Place for YOU In America's War Program...and In the Great Post-War Aviation Industry

as a TRAINED WEATHER FORECASTER

● Skilled Meteorologists are most essential to America's war program. As a trained weather forecaster you can serve your country in an important capacity. As an experienced meteorologist after the war you can enjoy a lifetime professional career.

SPARTAN'S modern Meteorology Department will provide you the type of specialized training America needs and is looking for today. Three fluorescent-lighted laboratories filled with latest equipment, an authorized weather station, an observation tower, and skilled personalized instruction assures complete training that enables you to qualify for numerous positions as observer or meteorologist.

As a result of the tremendous military pilot training program, the Air Forces Technical Training Command is making very attractive offers to qualified meteorology teachers. Positions in the field, paying from $1,260 to $5,600 annually, are begging for trained applicants. Both men and women are needed.

Whatever field of aviation you may choose —weather forecasting, flight, engineering, mechanics, radio or instruments — this Government Approved, industry-recognized school offers you advantages obtainable at no other aviation training school in America. Don't miss today's big opportunity to serve your country in an important way—and to prepare for the great post-war commercial aviation industry.

SPARTAN

SCHOOL OF AERONAUTICS

DIVISION OF SPARTAN AIRCRAFT COMPANY

● **Now is the time for you to get YOUR specialized training. Mail the coupon for the new SPARTAN 64-page catalog. NEXT SEMESTER STARTS OCTOBER 12th.**

Spartan School of Aeronautics—Captain Maxwell W. Balfour, Director
Address Dept. PA102, Tulsa, Oklahoma

Send me your new Catalog, describing in detail the SPARTAN courses I have checked, also stating tuition and living expenses.

Name ..... *Age*.....
Address .....
City ..... *State*.....
Previous Education .....

CHECK COURSES YOU PREFER

- ☐ Commercial Pilot
- ☐ Airline Pilot
- ☐ Commercial Flight Instructor
- ☐ Airline Maintenance Engineering
- ☐ Aeronautical Engineering
- ☐ Aircraft or Engine Mechanic
- ☐ Aircraft Sheet Metal
- ☐ Aircraft Assembly Mechanic
- ☐ Airline Service (A&E) Mechanic
- ☐ Airline Communications
- ☐ Private Pilot Course
- ☐ Weather Forecasting
- ☐ Instrument Technician
- ☐ Women's Instrument Tech'an

cents, the cost is five cents and, though at present airgraphs may only be sent to army, navy and air force personnel, there is a possibility that they may be extended for ordinary civilian use. Canada has recently introduced an airgraph service across the Atlantic to the Canadian forces overseas and, though a return service is not available as yet, the stationing of American troops in Great Britain and the opening of the direct North Atlantic air route again this summer should make the airgraph available in both directions.

Airgraphs have solved the problem of letters for the men serving away from home and letters, next to food, are perhaps the most important items for a soldier's, sailor's or airman's comfort.

Some doubts were felt at first because of the lack of privacy in airgraph letters. But in these days of censorship all ideas of privacy for letters of any kind has been abandoned. But after watching the airgraph process at the General Post Office in London, any misgivings about letters being read would vanish. A comparatively small staff, handling 1,000 to 1,500 letters an hour, has no time to stop and read—even if so inclined.

Airgraphs are written on special forms, 11 by 8 inches in size, which are available at any post office in Britain. The address is printed in large block letters in a special panel at the top and the rest of the letter can be written, printed or typewritten. The amount that can be said on one form is surprising. The special forms are free and the total cost for sending an airgraph is five cents in stamps. There is no limit to the number of forms that can be sent for any one letter at five cents per form.

The forms can either be handed in at any post office or sent direct to the airgraph section at the head office in London. There they are sorted into army, navy and RAF units and each is stamped with a number so that if by any chance one is lost or does not reproduce well (a very rare occurrence), it can be replaced.

Outward airgraphs are all dealt with at the General Post Office. In batches of 100 they are sent to the photographic recorders, which automatically reduce them on microfilm to the minute size of ½ by 11/16 inches. About 1,700 letters are photographed on each 100-foot roll of film, and this is packed in a small container ready for dispatch. On arrival at their destination the airgraphs are enlarged on photographic paper to five by four inches, folded once, put in envelopes and delivered. The original letters are kept by the British post office for a few weeks and then destroyed. All inward letters are sent straight to Kodak, Ltd., and the printed letters are delivered to the post office for despatch.

So far not one airgraph has been lost in transit. The average number dealt with daily is about 83,000. During the war, timetables of the departure of services of British Airways may not be given, but whenever a service is leaving the country the post office is informed of the amount of space available for air mails. Ordinary air mail letters are still accepted, but preference is always given to airgraphs. Services may leave the country several times a week and the stages to be flown are long, but every 10 pounds of payload available means about 37,500 airgraphs.

Though introduced as a wartime measure for the military forces, the airgraph could be effectively applied to all mails, thus saving shipping space—if a few more airplanes were available. Airgraphs for the Atlantic services would mean a welcome speeding up of communications and make more space available for other purposes.

There are possibilities, also, for after the war. For cheap, quick communications throughout the world—especially for business letters and such items as bills of lading—the airgraph would be particularly applicable. More important letters could be carried at higher rates, corresponding to the present air mail cost. With the two—the airgraphs and the ordinary, sealed air mail—all mail could probably be carried by air as an economic proposition and without the large subsidies needed for an air mail scheme such as the pioneer British Empire Air Mail Scheme before the war.

END

Award to Boeing School

THE Boeing School division of United Air Lines has been awarded a merit pennant by the Army Air Forces Technical Training Command "for outstanding service" in the training of Air Force mechanics and technicians.

POPULAR AVIATION for October, 1942, featuring silhouettes and data sheets from FLYING is available at 10c per copy. Send your request to Circulation Department, Popular Aviation, 540 North Michigan Avenue, Chicago, Illinois.

The Ramming Russians

(*Continued from page 32*)

course for home, steadily losing altitude. I continued to attack the enemy and gave him about six bursts, following him down to about 7,500 feet, when my ammunition gave out. What was I to do? I could have followed the bomber farther but that would have been useless. With only one engine it could still fly quite a distance and perhaps escape. There was only one thing to do—ram the enemy.

"I decided to chop off his tail with my propeller and opened my throttle. Only about 30 feet now separated the two planes. I could clearly see the armor plating on the bomber's belly as I approached from behind and below.

"At that moment the enemy opened fire with a heavy machine gun. A searing pain tore through my right hand. Immediately I gave my plane the gun and the whole machine, not just the propeller, struck the bomber. There was a terrifying crash. My fighter turned upside down. I unfastened my belt and drew up my feet, crawled to the opening and threw myself overboard. For 2,400 feet I fell like a stone, not opening my parachute. Only after I heard the roar of my plane to one side did I pull the ripcord. I landed in a small lake and made my way to shore."

Pilot Mikhalev of the Soviet Fleet Air Service was credited with ramming a Henschel Hs-126 in one of the first appearances of this new German aircraft on the Russian front. Mikhalev dived on the plane after exhausting his ammunition. His propeller ripped the Henschel's stabilizer and rudder. A flying piece of wreckage struck Mikhalev on the shoulder but he managed to bring his plane down safely. The plane crashed and burned.

Pilot Vinogradov did his ramming the old-fashioned way. Fighting a single Nazi bomber over a vulnerable Russian target he exhausted his ammunition without getting a decisive hit. Meanwhile a bullet punctured his gas tank and his ship burst into flames. Vinogradov hurtled into the Nazi bomber and both planes were destroyed.

Another Soviet pilot who rammed and lived to tell about it is Alexandrovich Kiselev. He escaped with only a scratch on his cheek after bailing out. His plane was lost.

"It didn't come off very well," said Kiselev in describing his ramming. "I am sure it is possible to ram an enemy ship without losing one's own machine. I was a bit excited and I suppose that is why I muffed the job.

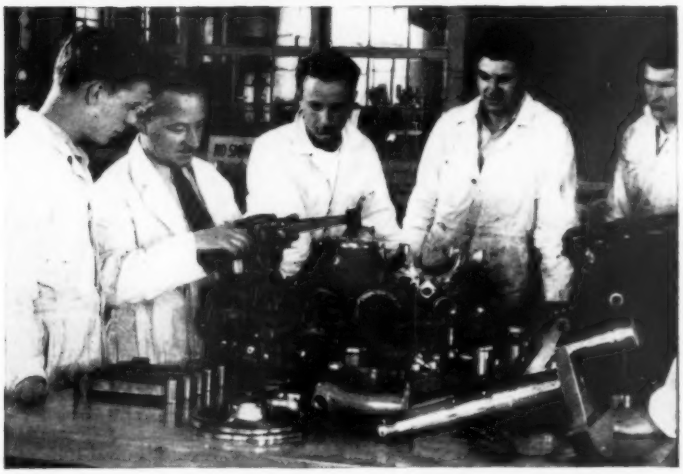
"My ammunition ran out. The enemy had hit my oil tank and radiator and my engine was just about giving its last gasp. I didn't want to let him get away so I went at him from below to get at his tail with my propeller. It was possible to calculate the movement so as to clip him with the tips of my propeller. But a stream of oil messed up my windshield and I couldn't see very well.

WAR TIME JOB or PEACE TIME CAREER You Can Have Both

NOW anyone can get a job in aviation, but with peace will come a demand for skilled technicians, then those with a thorough knowledge of aircraft mechanics can take responsible positions.
Don't be satisfied to "get by" during the present emergency, prepare for a career in America's No. 1 Industry.
Write for free folder, "Aviation—America's No. 1 Industry."

Luscombe SCHOOL of AERONAUTICS
DIV. OF LUSCOMBE AIRPLANE CORP.
61-65 PROSPECT ST. TRENTON, NEW JERSEY

BE "TOPS" IN YOUR FIELD
MECHANICS ★ ENGINEERING or PILOTING ★★



LEWIS OFFERS THE *Most Comprehensive* AVIATION TRAINING

LEWIS, founded in 1929, is among the oldest aviation colleges in America. Its comprehensive Master Mechanics and Flight courses have the full approval and recognition of the Civil Aeronautics Authority. Every LEWIS student receives personalized training—classes are limited in size.

All physical equipment and buildings are modern and offer the finest accommodations obtainable. The mile-wide 26-building LEWIS Campus-Airport is located just outside of Lockport, Illinois, less than one hour from downtown Chicago. There are 28 MODERN planes in the LEWIS fleet. The LEWIS faculty has been selected from the leaders in the aviation industry . . . they are also real leaders of men.

LEWIS is a non-profit aviation college—it was founded for the advancement of Youth interested in aviation. Living costs are the very lowest. LEWIS is truly an economy school. You may pay your room and board on a monthly plan and tuition may be paid in installments.

LEWIS is the only Aeronautical College in the country that offers a four year undergraduate Aeronautical Engineering course. It also offers a full curriculum of cultural college subjects which will enable the student to become a worthwhile citizen in his community. Among the many splendid LEWIS facilities are the modern-equipped Physics and Chemistry Laboratories, a regulation sized gymnasium, complete athletic and recreational facilities . . . in short, LEWIS offers the student everything he requires for the preparation for his career in aviation, private and civic life and he will enjoy training at LEWIS.

FREE . . . The new 40-page LEWIS School Catalog. Send for this catalog today. It will help you select the course best suited to your abilities, contains all the information about LEWIS—its facilities, accommodations, faculty and courses that you should know before you select your school.

CLIP AND MAIL TODAY

LEWIS
LOCKPORT, ILLINOIS
Dept. FPA-10

SCHOOL OF AERONAUTICS

Gentlemen . . . Kindly send me your illustrated Free Booklet. I am especially interested in (check course):

☐ Aeronautical Engineering ☐ Master Mechanics Course
☐ Flight Courses Age_____
Previous Schooling_____
*Name*_____
*Address*_____
*City and State*_____

LEWIS • THE COMPLETE AERONAUTICAL COLLEGE FOR YOUTH

"Just as I was approaching him the suction of the air whirls caused by the Nazi plane swept my machine upward. I got mad then and rammed him from above, digging into his left side. I knocked my face against my stick. If I had figured it out properly that wouldn't have happened.

"The enemy plane disappeared. My own plane went into a spin. I tried to pull out but it was no use. I took my feet off the controls, stuck my head outside and was knocked back into my seat by the air blast. I pushed off with one foot, counted to eight, ripped and floated down."

Lieutenant Katrich of the Soviet Air Force relates another ramming incident:

"At about 10 a.m. I was told that an enemy plane had been sighted heading for Moscow. I took off at once and soon spotted a vapor trail at about 18,000 feet. The enemy was above and ahead of me. I put my oxygen mask on and picked up altitude. I drew up to within 300 feet of the Nazi plane. I sprayed him from stem to stern. It was only then that the Nazi crew noticed me. The cabin gunner returned fire. I gave them another long burst until I saw flames streaking from their port engine. After the third attack my ammunition gave out and their tail gunner was silent. The left engine was burning but the plane continued to fly. The pilot was apparently counting on my fuel supply being exhausted. It was then I decided to ram him.

"I had thought a lot about ramming. The first reports of ramming by our flyers interested me but in most of them the planes had been lost. I thought it would be possible to ram without sacrificing one's own plane and here was a chance to test my theory.

"I approached the bomber from the left of its stern and aimed my nose at its tail, calculating my attack so as to clip its stabilizer and rudders with the tips of my propellers. My calculations proved correct. There was a slight jolt. I throttled back and banked. When I came out I saw the enemy gliding sharply downwards. I glided after it. The Nazi pilot made several attempts to level off. By gunning his motor he managed to fly level for a few seconds before dropping off again. He finally lost control and dove into the ground. The ship burned. I landed at my home airdrome. My plane was undamaged except for a dent in my propeller which caused heavy vibration."

One of the most spectacular instances of ramming which throws an interesting sidelight on the combat psychology of Russian airmen was told by eyewitnesses at the airdrome over which the battle occurred. Sgt.-Maj. Nikolai Totmin took to the air as his home field was attacked by eight Junkers Ju-88 dive bombers escorted by a pair of Messerschmitt Me-109 fighters. Totmin set one bomber's port engine afire with his first burst but was attacked by the Me-109 fighters before he could finish the bomber. Totmin banked sharply to battle the fighters. One Me-109 followed the bombers but the other stayed to take on the Russian.

Totmin and his Nazi opponent went into a tight circle trying to turn inside each other. The Nazi went into a quick climb and Totmin followed him. The Nazi then turned to attack and Totmin banked sharply to bring his plane hurtling head-on at the Nazi. Both planes sped toward each other but at the last moment before collision the Nazi heeled his plane over. At that instant Totmin banked in the opposite direction and drove his plane into the Nazi's wing.

Totmin's plane staggered under the shock and both planes spun earthward. Totmin twice tried unsuccessfully to bail out but the air pressure forced him back into the cockpit. The third time he got out but he was only 120 feet from the ground and his chute didn't have time to open. He fell not far from the wreckage of the plane he had rammed.

END

Come to Baker, California for your

★ **PRIVATE, COMMERCIAL and INSTRUMENT RATINGS**

★ **TRAIN AT ONE OF THE COUNTRY'S OUTSTANDING FLIGHT SCHOOLS**

Ten secondary trainers for advanced and acrobatic instruction—three radio equipped ships for cross country and instrument training.

Nine primary trainers for low-cost commercial and private license instruction. Every ship maintained for CPTP standards—all covered by insurance.

If you want the finest available instruction, combined with ideal climatic and living conditions—come to Baker and enroll with the United Flying Schools of America. We are now training primary and secondary students for University of Southern California and Pasadena Junior College—also CPTP Cross-Country and Instructor students.

Ralph Nemphill
President & Founder

Lieut. W. H. Coffin
Vice-Pres. & Operations Mgr.

UNITED FLYING SCHOOLS OF AMERICA, INC.

OPERATIONS BASE
Silver Lake Airport
Baker, Calif

Phone
Albany 8431

EXECUTIVE OFFICES
3455 Eagle Rock Blvd
Los Angeles, Calif

Computation by Nomograms

(*Continued from page 54*)

scale. One does not have to draw a line across the scales, as placing a straight edge on the nomogram will keep the chart in perfect condition.

Logarithmic scales are of greatest aid in constructing nomograms. Five logarithmic scales are given with their basic lengths noted. The scale 2L is twice the length of 1L. In case another length is required draw scale 5L on a paper and place a center point at a five-unit distance; for example, five inches. Then draw a parallel line at the distance the size of the scale is wanted. If the scale required is 2.5L the distance will be 2.5 from the center point. Connect all divisions on the scale 5L with the center point. Then their intersections on the parallel line will be the 2.5L scale. A single-line nomogram is shown in Section 1.

One does not have to understand the derivation of logarithmic values in order to use a slide rule or to construct nomograms with log-scales.

The characteristics of logarithms of figures is that the sum of two logarithms represent the product of the two figures. The sum of log. 2 and log. 3 is not log. 5 but log. 6. All we have to do now is to take two rules with logarithmic divisions, place them above each other and we have a regular slide rule. The use of a slide rule is simple. Place mark 1 over one figure and read the product on the second figure as shown in Section 4. If the second figure passes beyond the lower rule use the mark 1 on the other end of the scale. Two examples are noted in the sketches. The same setting is used when dividing 6 by 3 or 12 by 3. There is no zero point on a slide rule and 2,000 or .002 is located on the same mark 2. One has to be careful in reading between 1 and 2 shown in Section 4. The second mark 1 means 11 or 1100.

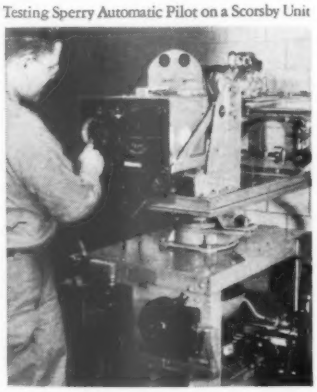
Substituting the regular scales in the nomogram of Section 3 with logarithmic scales, the process of addition will convert to multiplication. The two outer scales are laid out with scales having the same length and the center scale with half of the length of the outer scales. The center scale is located by a few trial calculations. The accuracy depends on the size and the exactness of the scales and of the layout.

The three-scale multiplication nomogram can be applied to many equations having three variables with various exponents. In Section 6 a layout for a nomogram conforming to the equation $Y=X^2Z$ or $X^2=Y/Z$ is shown. Three parallel equidistant lines are drawn. Then the directions toward increasing values indicated by arrows are found by visual checking with the equation. Then the scale lengths are selected. If the scale for Y and Z is 1L, then the scale for X^2 should be

The **Aircraft Instrument Technician** *Can Train His Sights on* **2 Objectives: VICTORY TODAY ...SECURITY TOMORROW**

Many graduates of other instrument courses come to C. S. A. I. for advanced training on Directional Gyros, Artificial Horizons, and the Automatic Pilot.

Testing Sperry Automatic Pilot on a Scorsby Unit



If you are looking for a way to do your part in our Victory program... if you're wanting a secure future for yourself... investigate the opportunities that await the aircraft instrument technician.

In Army and Navy air forces, at air bases and repair depots throughout the world, in aircraft factories, in instrument manufacturing plants, with the Civil Service, with the airlines and commercial air freight lines ... wherever planes are based, you'll find instrument technicians occupying key positions.

The Chicago School of Aircraft Instruments is the largest, best equipped school in America ... devoted exclusively to basic and advanced aircraft instrument training. In fact, it is one of the few schools equipped with Scorsby Test Units and Automatic Pilot installations for complete gyroscopic instrument training. This training is included in the C. S. A. I. Master Course requiring only 28 weeks to complete. Graduates of this course which covers general, electrical and gyroscopic instruments are eligible for Civil Service appointments without further experience or examination.

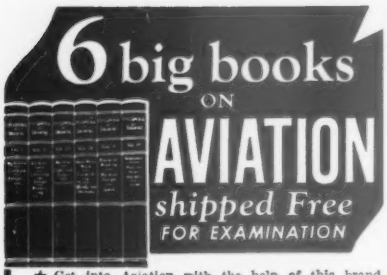
The school has been commissioned by the U. S. Army Air Forces to train enlisted men as instrument technicians. Civil Aeronautics Administration has awarded the school its repair station rating ... your assurance of qualified, recognized training so important to your success in this highly specialized field. Let C. S. A. I. train you for an essential place in our war program ... for a high pay future in America's greatest industry. Write for illustrated booklet showing present day and future opportunities in this fascinating field.

Get This Free Booklet

It gives you the complete story of this new and vital branch of Aviation ...shows you the opportunities that await the instrument technician.

Chicago SCHOOL OF AIRCRAFT INSTRUMENTS

2200 Lawrence Avenue, Dept. F-10, Chicago, Illinois



★ Get into Aviation with the help of this brand new cyclopedia just off the press. It is the most complete, most up-to-date set of books on this subject we have ever published. Aerodynamics, Soaring, Parachutes, Propellers, Ignition, Aircraft engines, Blueprint reading, Welding, Weather maps, Aerial photography, Air instruments, and hundreds of other subjects, all well covered.

for Beginners or Experts

Every man interested in flying, whether amateur or expert, should have these books. Written by a group of well-known experts in simple language so that anyone can understand them. Quiz questions and answers help to make this a complete reading course in Aviation. National Defense has opened up tremendous opportunities in this field. It is the fastest growing industry today with hundreds of opportunities for good jobs at big pay. Send the coupon for free examination. The complete set will be sent to you promptly.

Consulting Service Included

A full year's consulting privilege with our engineers now given without extra charge to every buyer of these books.

AMERICAN TECHNICAL SOCIETY
Dept. H716 Drexel at 58 St., Chicago, Ill.

American Technical Society, Dept. H716
Vocational Publishers since 1898
Drexel at 58 St., Chicago, Ill.
Send for 10 days' trial. BRAND NEW 6 volume set, Aviation. I will pay the delivery charges only. If I wish I may return books in ten days and owe you nothing, but if I decide to keep them I will send $2.00 after ten days, then only $3.00 a month until $19.80, the total price, is paid. Send BRAND NEW edition which includes Aviation Blueprint Reading and free consulting service for one year.

Name .....

Address .....

City ..... State .....

Please attach letter stating age, occupation, employer's name and address and that of at least one business man as a reference.

Just Published!

JANE'S
ALL THE WORLD'S AIRCRAFT

The world-standard reference for aviation!

Latest available data on aircraft development in every country on earth, not only for Flying Services, but for civilian and commercial aviation also; latest engines and equipment, output, records, etc.

Price $19

THE MACMILLAN COMPANY
60 Fifth Ave. NEW YORK

2L. However the center line has been selected for the X scale, therefore the scale should be 2L/2 or IL. All lines will use IL scale or any other scale of the same length. If a constant is in the equation the layout will be the same except the location will be different. The last scale must be laid out by making a few examples. The exponents indicate the size of the scale. If the exponent is 4 then the scale should be twice the length of the variable having an exponent 2. The center scale should be half the length indicated.

Another nomogram is constructed for the above equation in Section 8 by placing the variable X on the outer line. The scales are marked on the layout.

In Section 9 a nomogram is shown for the equation giving the relative horizontal flying speed if the wing loading and the absolute lift coefficient are known. The equation is squared in order to simplify the selection of the scales. The scales are of the same length. Placing the velocity on the outer line another nomogram may be constructed. The scales, however, will be 2L, 1L and 4L, as illustrated in Section 10.

Many equations have four variables. The same construction is used as for the three-scale charts. Two pairs of scales are connected by a common line called the reference, or turning, line. Usually the direction of connecting scales is from left to right. Therefore, the second and third scale will be half of the outer scales. A nomogram layout for an equation having four variables is shown in Section 11.

For the equation given in Section 9 a four-scale nomogram may be constructed as illustrated in Section 12. In this nomogram the center line gives the wing loading, which is useful in preliminary investigations of performance calculations.

Nomograms having five or more variables are constructed by using for each additional variable another reference line as shown in a layout in Section 13.

END

Helicopter Club

NINE young General Electric Company engineers interested in vertical flight have organized what is believed to be the world's first helicopter club. Pilot members plan to build and fly a full-sized helicopter at Schenectady, N. Y.

Train "Clipper" Skippers

PAN AMERICAN AIRWAYS is training 60 pilots selected in a nation-wide survey from among graduates of CPT.

Prepare for a Well Paid Career in—
AERONAUTICAL ENGINEERING!
DEGREE IN 27 MONTHS. Course provides thorough training for extraordinary opportunities in Government and industry. Modern wind tunnel, latest equipment.
PREPARE FOR AVIATION CADETS. Special preparatory courses for United States Army Air Corps in shortest possible time. Approved by Civil Aeronautics Administration for primary and secondary flight training.
DISTINGUISHED also for courses in Civil, Electrical, Mechanical, Chemical and Radio Engineering; Business Administration, Accounting, Secretarial Science. Special preparatory department for those who lack required high school work.
DEMAND FOR TRI-STATE GRADUATES greater than supply. Cosmopolitan student body. Enter Jan., March, June, September.
Write for catalog. 7102 COLLEGE AVE., ANGOLA, IND.
DEGREE IN 2¼ YEARS
★ TRI-STATE COLLEGE ★
Founded in 1884

I Learned About . . .

(*Continued from page 56*)

was reached there was still about 1,000 feet of altitude between the railroad and the clouds. Only 20 miles remained, and because of the speed of the Beechcraft, this distance would require only seven or eight minutes of flying time. It did not seem possible that during that short a space of time anything very dangerous could occur. The narrow V canyon was entered at the point where the elevation of the railroad first drops below 1,000 feet.

Now the airplane was flying in a V slot, the top of which was the ceiling of the clouds, and the sides of which were covered with pine trees. In the bottom of the slot there was the single railroad rack hung on the side of a mountain, and below it and to one side was the rocky creek, full of boulders and white water. The sides of the canyon were close together and it was obviously impossible to turn any airplane around within the confines of the canyon under the ceiling.

As the flight proceeded, within a minute or so, the ceiling started to decrease again and kept getting lower and lower until the airplane was forced down within 100 or 150 feet of the bottom of the canyon. The branches of the tall pine trees lining the sides of the mountains seemed almost to touch the ends of the wing tips and were close enough so that the individual pine needles could be distinguished clearly.

Because the canyon is as crooked as a snake's track, it was found desirable to slow down the airplane to about 130 m.p.h., which would permit ample speed to recover from a downdraft but still would make it easier to maneuver around the sharp turns.

Because of the crookedness of the canyon, it obviously was impossible to successfully pull up through the overcast without hitting one of the adjacent mountains, and therefore there was no possibility of doing anything except to continue the flight along the bottom of the canyon.

It all seemed rather amusing because the engine was running smoothly and there still was ample room to fly in, even though the trees were close and so was the bottom of the canyon. The air was quite smooth and no trouble was being experienced in following the groove. Suddenly, however, as a sharp turn was made at one of the twistings of the canyon, the next stretch ahead was seen to be filled with a dense rain shower. Visibility looked very bad. As soon as the airplane entered the rain shower, it was found to be heavy enough to obscure visibility through the windshield, and from that time on it was necessary to fly by observing the trees through the side windows, first on one side and then on the other, and trying to keep an even distance on each side. This was quite a chore, but fortunately no one else was in the airplane to make it difficult to look out the right side by occupying the right front seat. Turns were made by watch-

ARMY MERIT AWARD TO BOEING SCHOOL

OAKLAND, JUNE 30—In the first presentation of its kind ever made, the United States Army Air Force Technical Training Command today awarded to the Boeing School of Aeronautics at Oakland, California, a merit pennant for "outstanding service" in the training of air corps mechanics and technicians during the first six months of 1942.

The pennant, comparable to the Navy's famous "E Flag," was especially created by Commanding General, Major General Walter R. Weaver, for award to the Boeing School. It will remain in Boeing's possession for six months and will then be re-awarded to the technical training school performing the most meritorious service during the last half of 1942. Following is the letter from Major General John F. Curry regarding this award:

HEADQUARTERS FOURTH DISTRICT
ARMY AIR FORCES TECHNICAL
TRAINING COMMAND
1108 15th St., Denver, Colo.

Boeing School of Aeronautics
Oakland, California

June 30, 1942

Gentlemen:

As a reward for the outstanding services rendered by you in the performance of your contract with the Army Air Forces Technical Training Command of this district, I have been directed by the Commanding General, Major General Walter R. Weaver, to award you this pennant as a symbol of his appreciation for your accomplishments.

In times like these, when every effort must be bent towards winning the war, it is particularly gratifying to those in command to find the schools doubling their efforts towards fulfilling their task.

It is hoped that this pennant—a mark of distinction—will be flown from your flagpole until the first of January, 1943, at which time General Weaver will again make an award to the Civil Mechanics School performing meritorious service during this six months' period.

My personal appreciation is expressed to you for your efforts.

Yours very truly,

John F. Curry
Major General, U.S.A.
Commanding

We, at the Boeing School of Aeronautics, are indeed proud of the honor conferred by the Army Air Force Technical Command.

Thirteen years of experience in training pilots, engineers, mechanics, technicians, and meteorologists for airline service all over the world prepared our school for the job assigned to us by the War Department.

Now the urgent need for men trained for war-time aviation requires that all our facilities be devoted to the war effort. After the war is won we will organize a new training program to prepare men and women for their part in the expansion of commercial air transportation that will come when the world knows peace again.

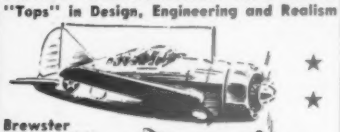
BOEING School of Aeronautics

UNITED AIR LINES

A DIVISION OF UNITED AIR LINES

OAKLAND AIRPORT • OAKLAND • CALIFORNIA

BUILD CLEVELAND MODELS
"Tops" in Design, Engineering and Realism



Brewster "BUFFALO"
Also known as "Peanut Special," Span 26¼" C-D "Master" Kit SF-87. **$3.00**

Lockheed P-38 "LIGHTNING."
World's fastest. Span 38¼" C-D "Master" Kit SF-85 **$4.00**

Vought Sikorsky "CORSAIR"
Estimated to be in "500 m.p.h." class. Span 30 3/16". C-D "Master" Kit SF-79. **$3.50**

Send 5c for latest catalog.
CLEVELAND MODEL & SUPPLY CO. INC.
4508B94 Lorain Ave., Cleveland, Ohio, U. S. A.

AERONAUTICAL ENGINEERING
DEGREE IN 27 MONTHS

Graduates employed by leading aircraft manufacturers in engineering and top positions. Qualify for present heavy demand at Indiana Tech. B.S. Degree in 27 months. Intensely specialized course of full engineering fundamentals including aerodynamics; airplane, seaplane and propeller design. Ultra-modern wind tunnel; precise and extensive equipment. Approved by CAA, both primary and secondary programs. Qualify educationally as cadet, Army and Navy Air Corps. Also complete degree courses—Chemical, Civil, Electrical, Mechanical, Radio Engineering in 27 months. Plenty of self-help opportunities in modern industrial city. Enter December, March, June, Sept. Catalog.

INDIANA TECHNICAL COLLEGE
1210 East Washington Blvd., Fort Wayne, Ind.

COLT 45 Cal. "FRONTIER" MODEL $1.45

Wood construction kit with working plans, machined barrel, cylinder and all necessary hardware.

COLT 45 Cal. "FRONTIER" model kit, 4¾" barrel	$1.45
COLT 45 Cal. "FRONTIER" model kit, 5½" barrel	1.55
COLT 45 Cal. "FRONTIER" model kit, 7" barrel	1.70
COLT 45 Cal. Automatic Pistol kit	1.00
Full scale Thompson Sub Machine Gun model kit	3.00
SAVAGE Cal. 32 Auto. Pistol kit, machined barrel	.75
LUGER Auto. Pistol with 4" machined barrel	1.75
LUGER Auto. Pistol with 6" machined barrel	1.90
COLT 25 Cal. Automatic Pistol kit	.50

These beautiful kits are complete in every detail and made of the best wood. All parts are cut to shape and require only a short time to finish. Postpaid in U. S. A.

GUN MODEL CO.
Dept. KA-210 2908 N. Nordica Ave. Chicago, Ill.

OUTDOOR FUN!

Indian
SPRING FRAME
MOTORCYCLE

Exclusive "Spring Frame" smooths out roughest country roads. New comfort, safety. Brilliant streamlined beauty. See your Indian dealer.

INDIAN MOTOCYCLE CO., SPRINGFIELD, MASS.

Prepare Now For **YOUR LICENSE**

Airplane mechanic's home-study course $1.25. Engine mechanic's course $1.25. Both courses $2.00. Postpaid or C.O.D. Contains all license questions with answers and accurate diagrams. Helps you tremendously in your mechanic's as well as Pilot's License Exams.

"250,000 Aircraft Mechanics needed for U.S. Defense."

MEYER ENGINEERING, Box 8-J Hempstead, N. Y.

ing the trees on the inside of the turn only and giving them as little clearance as possible, like a racer around the pylons.

For a while it was rather quick work maneuvering around the sharp turns of the canyon almost at its bottom with heavy rain falling and visibility almost zero. It did not last long and presently the valley opened up and the flight was continued north to Tacoma without further incident.

The moral of the story is that when wind blows clouds across mountains it should not be expected that the ceiling will remain at a constant altitude. As the wind flows across the peaks and hills the ceiling will come down close to the ground in many places because of the tendency of the air to follow the contour of the ground itself. This may trap an airplane in a canyon, and if the ceiling decreases to zero in the canyon, it may be impossible to avoid a crash. In my case I could neither pull up (on account of the crooked nature of the course and the hazard of hitting a mountain) nor could I make a landing. The railroad was set on a shelf gouged out of the side of the mountain, the river was full of rocks, and the trees covering the sides of the canyon were at least 150 feet high. There was nothing to do but go ahead—and fortunately that resulted in no serious trouble. However, if I had met a double-engined freight train puffing up the steep grade, during the rain squall, the smoke of the engines plus the rain might have created a really bad situation.

It was fun while it lasted—but I certainly wouldn't try it again.

END

Our Home Front

(*Continued from page* 32)

ginning of a program of unbelievable organization in the building industry.

Another firm was to build tanks. They tackled a corn field and in 12 months the gigantic buildings were finished, the machinery was on the floor in the proper place, the time studies were completed and the production line began to roll. That one plant today is turning out more big tanks than Hitler can produce in his whole country—and better tanks.

A certain motor car manufacturer was asked to take a contract for airplane parts. He took it, and while building the factory to manufacture these parts, he built the largest airplane factory in the world to build the complete airplane—and rumor has it that he has not even an order for that airplane yet, although the factory is said to be producing at considerable rate.

Every industry in America connected with war work has stepped up its pace, its quality, its organization and its patriotism a hundred-fold.

To America, this whole move so far has been a God-send. Many were concerned lest the war end with organized ignorance controlling the world, but with the coming of the total war program we have taken on and put into effect the greatest mass technical education the world has ever seen, with every man having the chance to get an education and industrial training of the most modern kind at no expense. This program will leave our country, at the end of the war, with the *highest educated groups any nation has ever known* and any man who has any initiative at all will be left with a trade at which he can earn a good living from now on.

This war is going to leave our people vastly higher in the standard of civilization while the peoples of the attacking power nations will be left in ignorance and squalor and discontent. Democracy's greatest opportunity after the war will be in showing these people the great asset and value to them in spending their surplus in things for living instead of things for destroying. These peoples were not vicious as they were born, but have been made vicious by sadistic leaders. When we get a world based on engineering, production, research, chemistry, metallurgy, flying and all such technically constructed industries, the age of ignorance will fade out and the age of old beliefs and opinions will die of its own stagnation. We will not need to fight the negative, they will disappear automatically, as did Voodooism in the past, and America will take a new place in the world—not as a military leader or strong-arm gangster, but as the director of progress to show the world the actualities of progress through research and unselfish devotion to mankind itself, bringing order and happiness to a newly made world.

In many other lands, the motor cars, airplanes and other vehicles have been owned only by the army and the ruling heads. The people haven't been allowed to own or use them.

In America everyone drives a car and therefore our boys learn to fly pursuit planes in two-thirds the time it takes for other nations.

Our boys know and feel mechanical things.

In the future every youth in America must fly if we are to have as many planes in the air as we have motor cars on the streets. Then no nation in the world will dare attack us in a war.

America today could build, as Mr. Ford said, a thousand planes a day of the small types. We can turn out a thousand trained pilots a day to fly them—and this stage should be approached as soon as our other activities get well underway.

Production is America's middle name —*so let's get all the airplanes in the air we can with everybody "air-conditioned," for the first nation which leaves the ground and lives in the air will thereby control the world.*

END

One Way to Get 'Em Up

THE first airplane jack ever developed has been placed on the market by Pittsburgh's Duff-Norton Manufacturing Company. Capacities range from five to 20 tons, according to model. Smaller units are manually operated, while larger ones may be worked either by hand or by electricity.

MAKE YOUR FUTURE IN THE INDUSTRY WITH A FUTURE

FALL CLASSES START SEPTEMBER 28, 1942

ROOSEVELT AVIATION SCHOOL—at Roosevelt Field, Mineola, Long Island, N. Y.

Without obligating me, send details of course checked:

☐ PRIVATE PILOT ☐ COMMERCIAL PILOT ☐ COMBINATION FLIGHT-MECHANIC
☐ MASTER AIRPLANE & ENGINE MECHANIC

*Name*_____ *Age*_____

*Street Address*_____ *Town*_____ *State*_____

P. A. OCT., 1942

Power in Manpower

(*Continued from page* 48)

p.m., there are few of the boys with any thought save that of crawling between the sheets.

Even on their "liberty" periods, the boys are not permitted to go more than five miles from the school and they are forbidden to ride in automobiles or to smoke on the streets.

If a visitor got up early enough, he would find the students turning out at 5 a.m. to begin a day that leaves neither a dull moment nor a dry shirt for any of them. Even in 95° heat, they learn football plays to develop their agility, although the schools are by no means "football foundries," they wrestle, box, march, run stiff obstacle races and, above all, they swim.

The course was designed deliberately to equip the boys for the type of tasks they are likely to encounter when they take the air against the enemy.

Obviously, for Naval flyers who may be shot down at sea or have their carriers sunk under them, swimming was a top-of-the-list "must" in the toughening program. At Chapel Hill, they spend hours in the university's huge tank, learning to swim for long distances under water, to jump from the high board with all their clothes on, simulating a leap-for-life from the lofty deck of a carrier. They are drilled in the old-fashioned breast-stroke, side-stroke and back-stroke, for the coaches decided at the start that the various "crawl" strokes would be no good to men struggling for their lives in rough seas.

By the time each student completes his 12 weeks at the pre-flight school, he is required to be able to stay afloat in the water for five hours at a stretch!

Without going too much into detail, it may be said that the physical fitness side of the program is based chiefly on 10 basic sports, many of which, however, have been changed from the peacetime mold to fit the wartime purpose. Wrestling, for instance, includes the best features of jiu-jitsu and judo, the idea being to teach the boys how to disarm potential Jap opponents and render them helpless. Big Ed Don George, former professional wrestling champ, is one of the instructors in hand-to-hand combat at Chapel Hill, for instance, and daily his classes can be seen "fighting" with rubber knives. The unarmed students are taught the best methods of taking the weapons away from their opponents and, at the same time, of slashing their jugular veins or severing arm or leg tendons to put them out of action.

Long hikes form an important part of the program to develop the endurance of the students. Before conclusion of the course, each one is taken 40 or 50 miles distant from the school—into the Blue Ridge Mountains, in the case of the Chapel Hill unit—given a pocket knife, a compass and the Navy's so-called "iron rations" and told to make his way back.

The object of that test, of course, is to train the student to "live off the country," fend for himself in the event of being forced down in some remote spot, such as the South Sea isles.

Soon after a student arrives at a pre-flight training school, he is given what is known as a "fitness test." This consists of putting a bag containing one-third of his own weight of sand upon his back and making him step up and down in cadence off a 16-inch step. The object is to continue the exercise for five minutes, but none of the boys ever is able to do it at first. Early in July, a carefully-chosen group of "average" students was selected at Chapel Hill and given the fitness test again. That time, every one of them went the full five minutes. At the end of each such test, the pulse rates of the boys are taken carefully at intervals to determine how long each takes to return to normalcy.

Throughout the course, the boys are watched closely as individuals so that the directors know on which phase of the training each needs to concentrate to obtain the maximum development.

Despite the rigors of the program, the average weight of the students increases after the first couple of weeks at a pre-flight school. The fat boys cut their waist lines down an average of two inches, sometimes as much as four inches, and the thin men put on poundage. Up to mid-July, not a single student had "bilged out" at Chapel Hill for physical reasons. By far the majority of them had not been athletes at school or college and one boy even went so far as to say that he could not remember ever having broken into a run in his life!

One reason the boys gain weight under the strenuous exercise is their diet. In contrast to the average civilian's consumption of about 3,700 calories daily, the boys put away an average of 5,140. They get meat three times a day and other foods rich in energy-producing carbohydrates. Pie a la mode is common.

They drink at least 16 ounces of milk every time they sit down to a meal. They get lots of ice cream and, to offset the excessive perspiration induced by their heavy work, they get three 15-grain salt tablets daily.

Injuries are fairly common, although the majority are of a minor nature, mostly sprains, blisters and bruises. Broken bones have been remarkably uncommon, at least at Chapel Hill, in spite of the throwing around the lads get from each other on the football field or on the wrestling mat. Instructors relate numerous instances of how the boys concealed the fact that they had been injured, rather than drop out of any part of the program.

"We have to depend on their team mates to inform on them," said big, genial Harvey Harman, former Penn and Rutgers grid coach and now a lieutenant commander in charge of athletics at Chapel Hill.

Harman, his khaki shirt black with sweat from a tireless tramping around from one activity to another, classed the Navy's pre-flight training program as the greatest thing of its kind that ever had happened to physical education in America.

"I would like nothing better than to go on teaching this sort of thing from now on," he said, seriously. And there are growing indications that he may have his wish.

State educational authorities in North Carolina already have signified an intention of instituting at least part of the program in the high schools of the State, a step in which the American Legion is taking great interest. Early in August, groups of about 100 coaches from the nation's high schools and colleges moved into the pre-flight training schools for a month's look-see with a view to determining what portion of the program they could use at their own schools.

Lastly, Secretary Knox is anxious to have the Federal Office of Education sponsor a plan for nation-wide adoption of at least part of the program in all high schools.

One phase of it which would be ideal for all schools and colleges is what they call "military track" at the pre-flight centers. It is a particularly concentrated form of obstacle racing, primarily. Over a 600-yard course, the boys scramble unassisted over high board walls, jump or swing across wide ditches, crawl through narrow tunnels, scramble up and down over intricate timber obstacles and race across loose logs, through deep sand and over simulated rooftops. They must be able to complete the gruelling course in four minutes and already that time has been almost halved at Chapel Hill.

Manual labor of a back-breaking variety is another important item in the training. The boys march out with axes, picks and shovels and do a daily stint of road-building, ditch digging and tree-felling. At the University of North Carolina they cleared a tract of timberland large enough to accommodate half a dozen baseball diamonds and put in large quantities of draining pipe in the first three months the school was in operation.

When they get through with that type of work, do they get time off then to rest up? They do not! On the contrary, they are marched off to the next part of the course which might be wrestling, touch football or a skull session on the recognition of enemy aircraft. Usually the mental studies are left for the evening hours after supper. That is, up until the riotous hour of nine.

All told, they devote about six hours daily to some form of physical exercise. A lot of it is spent in competitive games, but with the knowledge of how the competitive system in our schools and colleges forces all but the cream of the physical crop to the sidelines, the pre-flight training coaches have wisely decreed that there must be plenty of opportunity for the less proficient to participate without odious comparisons. For instance, in many of the exercises, the participants race against time, rather than against each other.

Although the majority of the students were not active in athletics in either high school or college, the pre-flight coaches have found marked differences in their athletic abilities. Generally speaking, the boys just out of high school are in better shape than those from college or

(*Continued on page* 116)

These are the hands that built the planes that bombed the cities of Germany, Italy and Japan. These are the hands that launched the ships that carried the troops that annihilated the enemy. These are the hands that will win the war; will write the peace; will give liberty and justice to all men.

DALLAS AVIATION SCHOOL & AIR COLLEGE

MAJOR W. F. LONG, Dallas Aviation School,
Love Field, Dallas, Texas.

LOVE FIELD, DALLAS, TEXAS

Without obligation, please send your catalog to:

Name..... Age.....

Address.....

City..... State.....

PA-10-42

YOU CAN'T MAKE MONEY WITH A PRIVATE LICENSE!

Tired of having your flying cost *you* money? Here's a new kind of refresher course that will put you on the paying side of flying—with a Commercial License and an Instructor's Rating. No college training necessary.

Hundreds of new instructors will be needed for the expanded government flight training program. First choice of these jobs will go to men trained in government approved commercial schools.

If you can pass the physical examination for a Commercial License, and have logged 150 hours or more, a short period of intensive training will qualify you for one of these high-paying jobs.

The Currey Flying School offers this training under a staff of fifteen competent instructors. The course includes all ground school and flight training needed to qualify you for a Commercial License and an Instructor's rating.

Why wait? *Every instructor trained during the last two years at the Currey Flying School is now working in flight schools or as a commercial pilot, a number as ferry pilots.*

Write immediately to the Registrar, giving educational qualifications and flying experience, and you will receive full information by return mail. Our curriculum also includes a complete course for the beginner. Write now!

THE CURREY FLYING SCHOOL
MUNICIPAL AIRPORT GALESBURG, ILL.

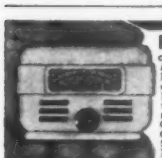
Be a RADIO Technician

Learn at Home. Many Make $30, $40, $50 a Week

The Radio repair business is booming due to shortage of new sets. The Government is spending millions for Radio equipment; CIVILIAN Radio technicians and operators are needed by Government in large numbers. Radio training helps win extra rank, extra pay in Army, Navy. Get into Radio quick. Train at home. Free book tells Radio's opportunities, its bright future, how to make $5 to $10 a week extra fixing Radios while learning. Mail coupon.

MR. J. E. SMITH, Dept. 2KY7
National Radio Institute, Washington, D. C.
Mail me your book FREE. (No salesman will call. Write Plainly.)

NAME.....AGE.....
ADDRESS.....
CITY.....STATE.....



POCKET RADIO!
or PURSE SIZE
About Cigarette Package Size! Requires no tubes, batteries or electric "plug in"—Wt. only 1/3 lb.—Streamline plastic case. An unusual novelty—receives local stations. SIMPLE—NO UPKEEP! Costs nothing to play—ever! OWNERS REPORT 2-3 YEARS SERVICE—THOUSANDS SOLD. B. W. of Wisc., says: "WORKS SWELL"—!

— — ONE YEAR SERVICE GUARANTEE — —

Sent complete with midget individual earphone, Instructions, hookups etc.—ready to listen! Easy Payment Plan as follows:
SEND ONLY $1.00 (cash, M.O., Check) and pay postman $1.99 plus postage on arrival or send $2.99 for postpaid delivery! Get your new Midget now—for real enjoyment. Ideal gift. ORDER NOW!
MIDGET RADIO CO., Dept. FP-10 KEARNEY, NEBRASKA

"G" LINE FLYING
Sensational! - New - Thrilling

THE BABY SHARK
Newest "G" Line Sensation Designed for all Class A & B Motors, the BABY SHARK flies at tremendous speeds of from 50 to 75 M.P.H. Amazingly Stable in Flight.
COMPLETE KIT.
Only $1.98. Postage 25c
Illustrated Descriptive Folders 5c
VICTOR STANZEL & CO.
Schulenburg, Dept. P, Texas

Night Vision

(*Continued from page 56*)

A pilot should have "touch" familiarity with his controls, not only rudder, stick and throttle, but switches, fuel valves, radio controls, trimming tabs, flap landing gear, mixture, propeller pitch controls and a host of others.

Because often it is impossible for pilots to function efficiently without the use of some instrument light, certain important rules must be observed. Use as little light as possible for as short a time as possible and use red light, preferably of a certain dim shade, which will permit useful sight without destroying dark adaptation.

There is a vast difference between day and night vision. Whereas, in the daytime, one sees with the visual center of the retina, at night the use of parafoveal vision, or the "corners of the eyes" is one of the most effective tricks of night vision. Actually, the image of a dimly lighted airplane can be picked up more quickly by the sensitive parafoveal portion of the retina than by looking directly at it.

A good night pilot must practice scanning or moving his eyes often in dim light. Nothing can be seen while his eyes are rolling but they are most sensitive just after being moved.

Night sight is wholly colorless vision and is therefore wholly dependent on contrast. Anything which reduces contrast, such as haze, fog, dirty or scratched windshields or goggles, will seriously impair night vision. Such surfaces must be kept scrupulously clean. By the same token the pilot must avoid contrast himself while in contact with the enemy. If conditions permit, he should fly below him if over dark ground, above him if over bright clouds.

Spotting the motion and size of objects at night also varies from day procedure. Motion of a plane at night can be detected before the plane itself can be seen and for that reason the direction of approach should be known as far as possible in advance to allow time for spotting. The average airplane is too small to be seen much beyond 1,000 feet, even on a clear, starlight night, and is visible then only from certain angles. From ahead or behind, it presents too small an area.

Night binoculars are valuable, the Navy finds, when they transmit enough light to magnify yet do not reduce light.

A great deal of publicity has been given to the effects of drugs and vitamin doses on night vision. Caffein and benzedrine are said to relieve fatigue and aid alertness but, since often they are more harmful than beneficial and their actions affect individuals differently, no simple rules can be prescribed for their use. The Navy recommends that use of these be controlled personally by medical officers.

While it is true that vitamin shortages impair night vision, it does not follow that extra large vitamin doses will improve seeing at night. The Navy endorses a well-balanced diet of "protective" foods, such as fresh vegetables, green salads, fruits, cream, milk, butter, cheese, eggs, meat, liver and fish. Again, all diets should be supervised carefully by medical officers. Vitamins should be available aboard ships whose menus become restricted after a long time at sea.

Sleep is as important as diet. Lack of rest not only reduces night vision but greatly lowers levels of general efficiency. Excessive use of tobacco also materially reduces visional efficiency.

The ability to see at night is greatly and seriously reduced by failure to use oxygen at altitudes above six or eight thousand feet. Instrument markings seem dimmer, the pilots turn on pilot lights more and more brightly, thus starting a vicious circle which impairs night sight. Use of oxygen in night flying should begin on a lower level than in daytime.

In summation, it is absolutely vital that pilots do not break training. No matter how faithfully they follow the prescribed rules, no matter how long they remain in complete darkness, a single lapse will destroy the entire dark adaptation. One minute of light will wreck an hour of preparation. It may mean the pilot's life.

END

From Headquarters

(*Continued from page 42*)

keeps hours about the same as he did in 1921, leading the New York-Nome, Alaska flight. Arranged an appointment for a friend of mine this week and Billy made it for 7:30 a.m. The last one I had made with him was for 7:30 p.m.

* * *

A change is very noticeable here. It is as if "no loitering" signs had been put up along the thoroughfares. People on the streets, however hot and dusty, walk along with spirit and energy; their faces serious, but not heavy. They look as if they had their shoulders to the wheel and as if they were getting used to it. It is always an inspiring sight to me, these dense moving throngs of workers, and the cross section of types is essentially American. As I watch them I cannot but look across the lawn of the White House, to the study windows of the president, where lights burn till the early morning hours *every* morning. However late his fellow executives may work or overwork, here is one whose days are never long enough, whose appointments are never finished and at whose energy and determination the most hardened toilers gasp.

Yet the strain of heavy news on the battlefronts, the growing pace of production, and the thinning of the ranks of our uniformed friends, is visible on all sides. Not that it is somber for a minute. It is a stimulating influence, like marching orders; and everyone here is more and more affected by what I call a *sense of emergency.* As they have less time for their personal lives, people have eliminated unnecessary motions, false situations and words. People are simpler in wartime, kinder as the weight of responsibilities and sympathies for others touch their minds. One comes to the point in conversation quicker; speaks more readily from the heart.

* * *

We heard the Queen of Holland ad-

School of Aeronautics

IF INTERESTED IN *AVIATION* AS A CAREER—THEN YOU SHOULD BE INTERESTED IN *STEWART TECH* TRAINING.

A tremendous air-age is being ushered in by the war-development of over-ocean and overland flying. Authorities are predicting that Aviation will become the dominant mode of transportation, and the Industrial Giant, of the future.

Thorough, top-notch technical training is a prime requisite for a career in Aviation. This type of training is yours at Stewart Technical School, a government-approved school with a long and distinguished record in the training of Aeronautical Draftsmen and Aircraft Master Mechanics.

Full Information On All Courses Mailed On Request.

Ask for Catalog No. 12 J.

SCHOOL OF AERONAUTICS
STEWART TECHNICAL SCHOOL
FOUNDED IN 1909 • SPECIALIZING IN AERONAUTICS SINCE 1929

STEWART TECH BUILDING, 253-5-7 W. 64th ST., NEW YORK, N. Y.

dress Congress. It was an impressive sight. Unlike the applause that heralded the appearance of Churchill at his recent visit, Wilhelmina entered in silence. All arose and remained standing until she had reached the stand. Then irresistible applause broke out. The sight of Queen Wilhelmina's lonely figure, steadfastly and courageously "on the job" in spite of her immense losses, touched every heart there. She spoke magnificently, with a simplicity that is particularly her own, and when, at the close a voice shouted in dutch, "Long live the House of Orange"; she gave a quick, happy glance at the galleries while wave upon wave of spontaneous applause rolled over the House. There was not a dry eye among us.

END

Cologne Raid

(*Continued from page* 30)

to the target. I took a quick look ahead, and saw a heavy bomb burst, leaving a blood red dome of flying destruction above it. Then I settled down to follow Steve's instructions.

"Steady now, steady. Hold her steady, will you? Am I supposed to be a bomb-aimer or a trapeze artist?"

The guns to the north of the town got our range, and shrapnel crackled outside the cockpit.

"Steady—left a bit—steady—" Steve's voice droned on, and then suddenly he said: "Bombs gone."

The nose lifted as the heavy load went off, and I stood the aircraft on her wing tips to watch where they fell. A huge area of flaming devastation passed below. Every quarter of the town was on fire and still, every few seconds, the merciless sticks of incendiaries were exploding all over the half destroyed buildings. Suddenly, right beneath us came a slow swelling earthquake as our heavy bomb hit, and our bursting incendiaries lit up every detail on the ground. Roofs rose grotesquely, walls sagged outwards, whole buildings swelled to twice their size, and collapsed into a molten mass of blazing wreckage. Everything around us was obscured as we dived into the column of smoke. As we came out we saw three aircraft ahead, running straight and level and pouring in their bombs by the trainload. We turned for home. There was too much risk of collision to remain over the town.

I eased the nose downwards, and we dived towards the searchlights which were trying to hamper our aircraft coming in. The gunners, hunched in their turrets, squinted tensely down their sights; the moonlit earth came racing upwards. I held the nose down until we were just over the treetops, and then pointed for home. We were travelling fast. A searchlight switched on at point-blank range. The front guns rattled. A smell of cordite drifted back.

Another searchlight switched on, and another. I leaned forward and stared hard at the instrument panel. Red hot tracers poured up from the defense guns. The *Lancaster* lurched as shells exploded in the wing. . . . I saw a searchlight go out in a puff of blue smoke . . . another shell hit the tail . . . the rear gunner was laughing. It was a hectic five minutes. Then we were through.

They had hit us, but not mortally. In return—as a parting shot—we had smashed up some of their searchlights. In this minor tussle the score was even.

Soon Holland lay below peaceful in the moonlight. We climbed up and carried on towards home—with the red reflection on the whirling propellers to remind us of what 1,000 bombers had done to Cologne.

END

Air Pick-up

(*Continued from page* 28)

were made by a Stinson monoplane. In practice pick-ups preceding the demonstration a Piper *Cub* with the propeller removed was used in place of the glider.

Under the procedure that was developed, the glider is placed about 200 feet back of two uprights, between which a tow line is placed. Inside of the cabin of the pick-up airplane is a revolving reel, equipped with a built-in brake which carries a tow line cable and the grapple-hook.

As the tow plane approaches the pick-up ground station, the pilot levels off much as he would in making a landing, except that his speed is anywhere from 95 to 120 m.p.h. He lowers the pick-up arm and the hook at the end catches the suspended tow line. As contact is made with the airplane from 12 to 14 feet off the ground, the cable reel inside the plane is permitted to spin freely to pay out additional tow cable to cushion the initial load imposed by the glider's dead weight. Some of the shock also is taken up by the tow line itself which is made of nylon to give maximum strength with great resiliency.

Gradually the reel brake is applied, the glider smoothly gains speed, and by the time the tow plane has levelled off, the glider is airborne, to be cut loose when sufficient altitude has been reached.

The War Department stated that with further developments of this launching technique, its application to the heaviest transport gliders of the AAF is contemplated. And, it was added, the system "may eventually be adapted to the pick-up of large commercial freight and passenger glider trains."

END

Private Flyers

(*Continued from page* 46)

tinues to circle the spot until the ground forces reach it. And even then he or subsequent arrivals take up the reporting of the fight from the air, furnishing information as to the direction and progress of the blaze.

Here are pilots in whom Uncle Sam has invested no money, flying ships in which Uncle Sam has invested no money, doing a great job in national defense and burning only five gallons of gas an hour. They have proven their citizenship and their loyalty by joining the Civil Air Patrol. They are courageous, ready and willing. What more can we ask?

END

Join Factory Force

DISTRICT sales managers, salesmen, sales promotion executives and other personnel previously concerned in the sales and distribution of automobiles now have been "converted" to aircraft production, as have the plants which formerly produced the cars they sold.

Last December, anticipating the developments which since have put a virtual halt to the automobile distributors' business, Packard urged all of its field personnel, dealers and salesmen, to seek employment in defense plants and offered to help place them in Packard's own war work if their local facilities could not absorb them. As a result, many now are working in either marine or aircraft engine production.

Hurricane Season

A CAB safety bulletin points out that August, September and October are hurricane months along the Gulf Coast, Florida and the eastern seaboard. Aircraft operators should be on the alert, ready to take immediate steps to prevent loss of life or property if hurricane warnings are issued.

BECOME AN AIRCRAFT DRAFTSMAN THROUGH HOME STUDY

A lifetime of fascinating, well paid work. A real future and an opportunity to apply your own inventiveness and talents in the essential field of aviation. Ryan will train you through simple, thorough, practical home study.

Courses are prepared by active leaders of the aviation industry. Here is the field you want to enter. Here is the way for you to prepare successfully at home. Mail this ad now for full information and costs.

NAME ADDRESS

RYAN AERONAUTICAL INSTITUTE

1310 Lindbergh Field • San Diego, California

Pat

(Continued from page 40)

So it proved, for the firm she joined eventually became American Airlines, one of the half dozen or so leading carriers in the country.

But the word "eventually" covers the entire turbulent decade during which commercial aviation came of age and, at the beginning, it was a very gawky youngster indeed. Dozens of operators plied short routes, depending largely on air mail contracts. Passenger revenue, the only basis for an economically sound industry, was almost nil, for there was no real inducement offered in the way of regular through service. American Airways (as it was then called) attempted to build passenger traffic by putting together a transcontinental route, which competitors jokingly described as "New York to Los Angeles via Canada and the Gulf." Pat had many an airsick day before she got used to this New York-Buffalo-Cleveland-Memphis-Little Rock-Fort Worth-Los Angeles hop.

Like a baby, what the airline business needed was plenty of attention, and Pat had lots of tricks up her sleeve to get it. One that stands out in her memory is "the man with the missing nose." Glancing through a paper one day, she noticed a little story about a man in Memphis who felt a neighbor was paying too much attention to his wife, got into a fight about it and wound up with his nose bitten off.

Inspiration came to the O'Malley, approval came from her boss and forthwith an American plane was ferrying the victim of the bite episode to a plastic surgeon in Chicago. A huge sheaf of press clippings and photographs, with the plane prominent in all of them, furnishes proof that when a man bites a man, that's news, but when an O'Malley gets hold of it, it's aviation publicity.

News isn't always where you find it, either. Sometimes you have to make it, if you want to draw a publicity salary 52 weeks a year. For instance, there was the time American was introducing a night schedule known as the "Night Owl." Pat borrowed a couple of live owls from Billy Rose's "Jumbo" to fix up a window display advertising the run. The display attracted mild attention from the passers-by, but they were hardly an adequate audience, so—the Society for Prevention of Cruelty to Animals suddenly pounced down, with due coverage by reporters and the S.P.C.A. is probably unaware to this day who that irate female was who sent in the tip.

Another memorable bit of publicity was made when Pat showed how the ancient art of "cheesecake" could be given a new aviation twist. Cheesecake is the name given by newspaper photographers to pictures which feature the "form divine," usually found sitting on a ship railing with legs carefully exposed.

Gags were in order when the airplane, as a vehicle of passenger transportation, had to be grooved into the public mind, however sensational the means employed.

Buy your AIRPLANE on EASY TERMS the ACC way

Find out about ACC insured finance plans.

LOW DOWN PAYMENT ★ EASY MONTHLY INSTALLMENTS

Quick service by telephone, telegraph or airmail. Write for complete details—or see your dealer—then select the plan that fits your needs.

AVIATION CREDIT CORPORATION of St. Louis

LAMBERT FIELD, ST. LOUIS, MISSOURI Phone: Terryhill 5-2911

Branch Offices: Dallas, Texas—Administration Building, Love Field; Phone: Lakeside 0714
Los Angeles, California—Van Nuys Metropolitan Airport; Phone: State 5-0174

Prepare NOW at this Lincoln School to earn up to $4,000 a year in employment vitally ESSENTIAL to America's war effort. 8 basic courses offered at Lincoln prepare for ANY field of Aviation you may choose to enter.

3 Great CAREER Courses

Aeronautical Engineering, a 15 months course: **Government Approved Mechanics Training,** a 35 weeks course leading to Government Rating as Aircraft and Engine Mechanic; **Government Approved Commercial Pilot's Course.** (approximately 36 weeks), leading to Commercial Pilot Certificate with Flight Instructor Rating. Exceptional high pay employment opportunities in all these fields for Career trained Lincoln Graduates. Training prepares you not only to render a vitally important service to your country NOW, but also for an important place in America's Commercial Aviation AFTER the war.

5 INDUSTRY APPROVED COURSES

Aircraft Factories, coast to coast, look to this Lincoln School for trained personnel to fill positions as Aircraft Inspectors, Airplane Assembly Mechanics, Airplane Draftsmen, Airplane Production Mechanics and Aircraft Welders. Good wages paid. Rapid promotion. Opportunities for thousands more Lincoln Trained Men. **MAIL COUPON TODAY** for complete information stating WHICH Lincoln Course most interests you.

Choose One of These 8 Lincoln Courses Send for Information

- Aeronautical Engineering
- Government Approved Airplane and Engine Mechanics
- Government Approved Commercial Pilot and Flight Instructor Course
- Aircraft Inspector Course
- Airplane Assembly Mechanics Course
- Airplane Drafting and Detail Design Course
- Aircraft Production Mechanics Course
- Aircraft Welder's Course.

Mail Coupon Today. Specify which of these courses you choose. Complete information will be mailed you.

LINCOLN AERONAUTICAL INSTITUTE
1410 Aircraft Building, Lincoln, Nebraska

SEND FOR FULL INFORMATION TODAY

Lincoln Aeronautical Institute,
1410 Aircraft Building, Lincoln, Nebraska

I'd like to prepare myself for essential employment in Aviation. Please send me information about your.....Course.
(Choose a course from the 8 courses listed above)

Name.....

Address.....

City.....*State*.....

LINCOLN GIVES YOU WHAT YOU NEED TO SUCCEED

How to install—use—test—maintain—repair—all kinds of aircraft instruments

Here, for the first time is available in one compact, easy-to-use book all the detailed information you need on all types of aircraft instruments: meteorological, engine, navigation and flight.

Just Out!

AIRCRAFT INSTRUMENTS

By George E. Irvin

525 pages, 545 illustrations, $5.00

The full and explicit treatment presented in this book is in accordance with manufacturers' recommended methods and airlines' procedures for all operations covered, and includes copyrighted information from these sources as well as working charts, formulas, tables, trouble-finding lists, etc., not heretofore available in a single book.

MAIL THIS COUPON

McGraw-Hill Book Co., 330 W. 42nd St., N.Y.C.

Send me Irvin's Aircraft Instruments for 10 days' examination on approval. In 10 days I will send $5.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name .....

Address .....

City and State .....

Position .....

Company .....

PA-10-42

It's as easy as this!

At New York's Grand Central Terminal just toss your bag to a porter and say "Hotel Roosevelt" . . . He'll escort you through our private passageway, direct to the Roosevelt lobby . . . Time-saving convenience and complete comfort . . . Satisfying meals . . . Attractive rooms with tub and shower, from $4.50.

HOTEL ROOSEVELT

BERNAM G. HINES, *Managing Director*

MADISON AVENUE AT 45th ST., NEW YORK

Gradually people were made aware of scheduled air travel, however, and the task of Miss O'Malley and her colleagues became one of getting it accepted as a normal, every day affair.

That meant switching over to a milder type of publicity. During her last years with American, Pat arranged such events as a birthday party on a plane in flight for a group of young girls, fashion shows of clothes for travel, modeled by stewardesses, and the like.

One notable interruption in this routine came in May, 1937, when the *Hindenburg* burst into flames at Lakehurst. Pat was there with an American plane to take some of the Zep passengers to Newark, but when the great conflagration occurred, her primary concern was to rush the news photographers' plates of the scene into print. She scurried about the huge field collecting them, hopped the plane, and delivered the plates at Newark to waiting motorcycle messengers, making her a heroine for all time with the camera boys.

Pat is not a pilot. Many years ago she started to learn, but after almost taking the roof off a hangar at Roosevelt Field, she decided that they also serve aviation who only sit and write. Of course she travels by plane every chance she gets, and in 1941 her flights included a trip to Guatemala to gather material for her new book, "Wider Wings."

From her thousands of miles of air travel she recalls several amusing incidents—the passengers' peculiar looks as she carried a huge red Christmas candle all the way from Los Angeles to New York, for the simple reason that it wouldn't fit into her bags . . . the time she had to hang her personal laundry to dry in a plane taking her from Miami to Washington, because the pilot was ordered to leave far ahead of schedule . . . her three months with a flying circus, which moved about so much that some mornings she woke up and had to look at the phone book to make sure where she was . . . and her mortification when she was kicked off an airplane in favor of a bag of spare parts.

By the time of the *Hindenburg* incident, airline business was definitely growing, but in a haphazard cut-throat way which threatened to put most of the carriers into bankruptcy. A central agency was needed to stabilize air transport economics, and to promote the neglected field of private flying. To fill this role, the Civil Aeronautics Authority was established in 1938, and it soon became apparent that for some time Washington would be the center of gravity of the aviation industry. Always anxious to be right in the thick of things where aviation was concerned, O'Malley was there holding down the press room when the Authority opened for business, and is today doing the same job under the Civil Aeronautics Administration.

Although Pat's CAA post is decidedly a full-time job, she has found time to write "Wings for Carol," a novel about an airline hostess; and "Wider Wings," a sequel which takes Carol to Central America. She also found time to serve a term recently as vice president of the Women's National Press Club, organization of Washington's ace female journalists.

A new Carol book, "Wings for Freedom," is in the making, even though right now Pat has her hands full telling the story of how civil aviation fits into the American war scene. Since December 7, her phone has hardly rested.

It's "Hey, Pat, how do we get our licenses back?" and "Say, Pat, What's going to happen to CPT?" and "Pat, what's the dope on this Civil Air Patrol business?" and "Pat, what do you know about Laura Ingalls?"

A member of the Civil Aeronautics Authority once told Pat, "We like to have you around because then people will know this is the place to come when there's something they want to know about aviation." It's our guess that if we ever get to Heaven we'll find Pat behind the information desk, ready to explain the Heavenly Air Regulations!

END

Letters

(*Continued from page 98*)

in this country, but also cannot help but make for good will with our allies, the English. Anything that in any way makes for a better understanding between our two peoples is of inestimable value and you have certainly helped this good cause along.

HENRY Y. SATTERLEE
Assistant Sales Manager,
Edo Aircraft Corporation
College Point, N. Y.

Sirs:

. . . This issue, as well as those devoted to the U. S. Army Air Forces and Naval aviation, is a very valuable addition to any aviation library.

STEADMAN TELLAR
Lieutenant Commander, U.S.N.
Navy Department
Bureau of Aeronautics
Washington, D. C.

Range

Sirs:

In "For Identification" [July, 1942] you stated that the Bell P-39 has "a range of 1,500 miles, although this figure has been increased with the recent addition of the belly tank."

I have understood that a pursuit plane had a range of between 400 and 700 miles. I also read that the Curtiss P-40 had a range of 700 miles. Medium bombers have a range of 1,500 miles or greater. I believe that 1,500 miles is too great for the range of the P-39. Am I correct?

D. J. GLEASON.
Carville, La.

● There are several types of fighters in the 1,500-mile range category. The type of short-range aircraft to which Reader Gleason refers is the high-speed, short-range interceptor which is intended to fight only close to its home base. However, no set range limits can be placed arbitrarily on bombers or fighters. The maximum range for any aircraft varies widely, depending upon payload.—ED.

END

SIRENS scream warning of an air raid! Civilian defense leaders leap to their posts! The last few city lights flicker out. People grope their ways to nearby places of safety. It's our country at war!

At times like these, aroused Americans want to help, want to fight or to participate in civilian defense work. . . . But last minute offers of service are of comparatively little value in times of emergency. It's service offered when there is yet time for training, so that adequate preparation for crisis periods may be made, that counts.

The Aircraft Owners & Pilots Association's offices are aiding registered AOPA pilots to find places in our military and civilian air services that employ their best individual qualifications. These pilots are taking advantage of this AOPA service *now*—while there's yet time for sound training and preliminary preparation. As never before, AOPA is functioning as the very heart of non-scheduled flying, serving as the voice of the private flyer in governmental circles, helping independent pilots solve their flying problems.

Join the largest body of organized private pilots in the world, AOPA's 7,000 members, in private flying's defense. *Don't wait until the blackout!* For full information about this most powerful, vigorous organization of aircraft owners and pilots, send in this coupon today!

AIRCRAFT OWNERS AND PILOTS ASSOCIATION
Registrar's Office—Dept. F1042
Michigan Square Building
Chicago, Illinois

Please send illustrated brochure telling how I can become a registered AOPA pilot, together with complete information on how I can do my part in America's civilian air defense.

NAME.....PILOT LICENSE NUMBER.....

ADDRESS.....CITY & STATE.....

(Sent only to aircraft owners or non-scheduled pilots who have soloed.)

AIRCRAFT OWNERS AND PILOTS ASSOCIATION

REGISTRAR'S OFFICE: MICHIGAN SQUARE BUILDING, CHICAGO, ILLINOIS ★ WASHINGTON SERVICE OFFICE: 1003 K STREET NW, WASHINGTON, D. C.

Classified Advertising

RATE: 8c PER WORD FIRST 15 WORDS $1.00

AIRPLANES—SALE OR TRADE

Aeronca

1941 AERONCA Super-Chief, Lycoming 65, dual ignition compass, extra tank, brakes, 200 hours, delivered anywhere in United States. Price $1395. D. L. Hollaway, Boulder, Mont.

Interstate

42 INTERSTATE CADET. Franklin 85. 92 hrs. total. $1900 or take over contract. $828.00 down. 6 payments of $126.50 per mo., then three of $105.00 per mo. Bill Myers, 5930 S. San Pedro St., Los Angeles, Calif.

Piper Cub

1941 PIPER Trainer. Model J3, Tandem. NC35751. Lycoming 65 Motor. Dual ignition. 789 Hours. Never cracked up or damaged. Always hangared. All periodic checks and factory bulletins carefully observed. $975. William Tomlinson, High Point, N. C.

Stinson

1940 STINSON 105 80 Cont. 365 hours. No time since complete major, excellent condition, standard instruments, twenty gallon tank, radio, licensed until August 1943. Photographs, $1750. C. Roarke, 2514-A Octavia St., San Francisco, Calif.

Taylorcraft

TRADE 1939 Taylorcraft, Cont. 50, perfect throughout for equity in late 65 or 75 H.P. ship. B. Sternberg, Rt. 3, Box 152, Seattle, Wash.

Miscellaneous

HUNDREDS of airplanes grounded on coast and at small airports. Send 25c for big war bargain Directory, giving location, owner's price and address. Cubs low as $125. Used Aircraft Directory, Athens, Ohio.

AVIATION SUPPLIES

RADIOTELEPHONE EXAM: 9 pages, 62 actual questions and answers on Restricted Radiotelephone permit including instructions. 50c, three $1.00. Bud Slocum Radio, Roscommon, Mich.

WHOLESALE: New Factory Stocks—Our Specials 6:00x6 non-skid, 7:00x4, 8:00x4 Smooth 2-ply $8.75, 4-ply $10.75, Tubes $3.25. Few 7:00x5, 8:00x5 and General 24" Streamline $15.00. We carry in stock 6:50x10, 7:50x10, 8:50x10. Regulars 8", 10" Smooth Contour. Specify ply. 6x2 Solid Tailwheel $1.65. Lowest prices. Immediate deliveries. New reliable tires, propellers. Bob Trader Aero Supply, Municipal Airport, Pittsburgh, Penna., 24 hr. Service.

THE Original Long-Visored Khaki Twill Flying Cap. "Beats the Sun." Stylish, Smart, Snappy. Sold on money back guarantee. With embroidered wing emblem $1.50, without emblem $1.25. Roy Paris, Box 1100, Houston, Texas.

BOOKS

SIMPLIFIED Instrument Flying—By Capt. Joseph Mackey, takes many headaches out of blind flight instruction. Complete illustrated book only $1.00. Aircraft Directory, Athens, Ohio.

AERIAL Cameras—How to make them from Ordinary Kodaks, complete 72-page illustrated book on Aerial Photography only $1. Aircraft Directory, Athens, Ohio.

SIMPLIFIED Instrument Flying—By Capt. Creighton Mackey, takes the headaches out of blind flight instruction; illustrated only $1. Aircraft Directory, Athens, Ohio.

SIMPLIFIED Flying — Easiest method of everything from take-offs to stunts and navigation. Illustrated book only $1. Aircraft Directory, Athens, Ohio.

SKYWRITING—How to make the equipment and use. Complete 70-page book, illustrated, only $1. Aircraft Directory, Athens, Ohio.

ACROBATIC and Inverted Flying—Complete illustrated book by Capt. Mackey showing how to do every stunt from simple wingovers to outside loops. Aircraft Directory, Athens, Ohio. Send for free circular of all our books on aviation.

USED, new books. Bargain prices. Outdated Magazines. Catalog 10c. Cicerone's, 863 First Avenue, New York, N. Y.

AIRCRAFT Hydraulic Systems — Attention, students, mechanics, engineers, draftsmen: complete information on design, testing and maintenance of commercial and military hydraulic installations. A specialized branch of aeronautics for you to get into now for only $2.50. Aircraft Specialties, 134 S. Waller Ave., Chicago, Illinois.

QUALIFY as Airplane & Engine Mechanic. 1942 texts prepare you for A & E rating (license) exam. Covers all phases required mechanical work, diagrams and latest Civil Air Regulations. Author holds A & E Certificate plus Aeronautical Engineering Degree. Aircraft text $1.25, Engine text, $1.25. Combination $2.00. Postpaid or C.O.D. Flight Press, Box 101-A, Edwardsville, Ill.

PRIVATE and Commercial Pilots, test yourself with "The Handbook of Aeronautics," original and oustanding multiple-choice Quiz Text. Over 1100 questions with answers, including complete copyrighted study system, diagrams Navigation, Meteorology, CAR, Airplanes, Engines. Study, test yourself, grade yourself! Used by thousands, pilots and ground instructors for classroom quiz. 1942 edition. $2.50. Question-Air System, 4230 McKinney, Dallas, Texas.

"FLIGHT Instructor's Aid," original multiple-choice quiz text on Flight Instruction Methods and Psychology. Over 200 questions. Study, test yourself, grade yourself! Answer key included. $1.00. Question-Air System, 4230 McKinney, Dallas, Texas.

"RADIOTELEPHONE Operator's Aid," third class, sixty actual questions, answers. Fifty cents. Question-Air System, 4230 McKinney, Dallas, Texas.

PILOT Log Books, New H.P. Classification, XC, Instrument, Night, Dual Given, Dual Received, etc. Spaces. 52 pages. Fifty cents, twenty cents by the hundred. Question-Air System, 4230 McKinney, Dallas, Texas.

500 AVIATION Questions correctly answered. $1.00. Agents wanted. Tuck Publishers, 73 South Shirley, Pontiac, Michigan.

INSTRUCTION

CORRESPONDENCE courses and educational books, slightly used. Sold. Rented. Exchanged. All subjects. Satisfaction guaranteed. Cash paid for used courses. Complete details and bargain catalog free. Write Nelson Company, Dept. K-237, 500 Sherman, Chicago.

AVIATION Cadet Home study course. 12 weeks. Designed to help you pass the preliminary Air Corps mental examination and the screening tests given to all cadets after induction. Rutherford Preparatory School, Box 347, Long Beach, Calif.

PATENTS

INVENTORS: Unpatented inventions now salable with positive safeguards under patent laws. New, low-cost procedure. Complete details free. American Patents Corp., Dept. 25, Washington, D. C.

115 MECH. Movement—Just what you may need to complete your invention. 48 page illustrated book contains valuable information for inventors. Yours —FREE. Write today. Victor J. Evans & Co., 612-K Victor Building, Washington, D. C.

PATENTS: Low Cost. Book and advice free. L. F. Randolph, Dept. 372, Washington, D. C.

HELP WANTED

MAN wanted for position of chief tool designer with large aircraft firm in the South. Must have had at least 12 years' experience in aircraft tooling of which 6 years should be in tool design. Write application to Box 205, % FLYING, stating experience, age, salary and personal photograph.

SITUATION WANTED

WOMAN Aircraft Instrument Technician. Graduate, Citizen, Maintenance preferred. Position anywhere. E. M. Upton, Maple Rapids, Michigan.

MECHANICAL engineer desires position in defense plant. College degree, experience in heating, ventilating, air conditioning, purchasing. Knowledge of plastics, aircraft engine testing, shop procedure. Employed, married. Box 204, % FLYING.

MISCELLANEOUS

PHOTOGRAPHS of "Messerschmitt Me. 110," "Whirlwind," "Devastator," and catalogue of latest Allied and Enemy fighters and bombers (including Japanese), 25c. Aeroplane Photo Supply, Box 195, Toronto, Canada.

ORIGINAL PHOTOS first plane flying over California. Three different, $1.00. Sam Fall, 139 Whipple St., Prescott, Arizona.

INSTRUMENT Service Company. Approved aircraft instrument repair station No. 1367, Aircraft clocks and watches, chronographs, sextants, chronometers, dial refinishing and illuminating, jewelling. Guaranteed work of the highest order at a fair cost. All final checks by John Milton, A & E No. 4580, pilots license No. 2483, instrument instructors license No. 168. 2217 San Antonio Avenue, Alameda, Calif.

OPENING, limited number of selected young men with $180, work board, balance flying time, radio beam, blind flying, aircraft radio license, commercial license. Noll Flying Service, Bellefonte, Pa.

WARPLANE photographs. Specimen and list (1,000 titles), send 25c. Real Photographs, Ltd., Southport, England.

WANTED—MISCELLANEOUS

CASH in on your Aviation Ideas! National, reputable organization will manufacture and market additional worthwhile lines of aviation parts, gadgets, instruments, accessories, etc., whether patented or not. Exclusive selling rights, outright purchase, or royalty basis, whichever you prefer. Write full particulars for quick action. Box B, % FLYING.

WANTED—Westwood Correspondence School Aircraft Courses for cash. Route 3, Box 390, Santa Ana, Calif.

Reply to Box Numbers % FLYING, 540 N. Michigan Ave., Chicago. This does not apply to Box Numbers where city and state are shown.

Power in Manpower

(*Continued from page* 108)

business life and they round into trim quicker. New arrivals at the schools are observed closely for the first few days in order to check their aptitudes. If they fall below certain standards, they are put in so-called "sub-squads" and given special instruction in the sports in which they are deficient. Experience at Chapel Hill thus far has been that approximately 18 per cent of the students land in the swimming sub-squad.

Perhaps the most impressive result of the training program is the splendid fighting spirit being developed in the boys. Hardened old football coaches, who have broken their hearts for years trying to develop team spirit in their charges, openly marvel at what happens at the pre-flight school. Even some of the husky young instructors, fresh from some varsity squad, are open-mouthed. After a workout with one group, one of the latter gasped:

"I don't know how the hell they do it!"

The best single sentence critique of the whole show, which bodes no good for either Nazi or Jap who runs afoul of the boys from the pre-flight school, came from a tired, sweaty but cheerful redhead who was asked what he thought of the program.

"If we live through this," he said, "we'll fly without planes."

END

NOW ONLY $6.95

REAL ENGINE VALUE

The G.H.Q. is a miniature gasoline engine that really operates. Over 15,000 sold in the last year. Now is your chance to buy the **New Improved** kit for $6.95. Absolutely complete with COIL, plug, simple instruction, etc. 1/5 H.P. All parts guaranteed. **For boats, planes, midget cars, etc. All parts finished. Only a Screwdriver Needed. Average assembly time 30 min.** Send only $1. Shipped Coll. C.O.D. same day. Send for FREE circular or 6c for Jumbo catalog of hundreds of plane and hobby items.

G.H.Q. MOTORS—Dept. P, 40 E. 21 St., New York

AUTOMOBILE RACING BOOK

Fifth Edition (Revised)

Well Illustrated

Contains 12 Chapters, 77 illustrations dirt track, championship, and midget cars. How to build engines, chassis and bodies. How to speed up Ford V-8 cars and rebuild Ford A and B engines. World's record cars described. Official AAA midget rules and international formula. Order Now—$1.00 postpaid. $1.15 C.O.D. Money back if not satisfied.

RAY F. KUNS, Dept. E-46, Madisonville, Cincinnati, Ohio.

*In New England It's—

ALLEN SCHOOL of AERONAUTICS

Division Allen Airways Contractors to U.S. Gov't

Qualify for C.A.A. license as aircraft and engine mechanic in a U. S. Gov't approved school. Learn, work on ships used in daily operations. Placement Bureau. New Class Starting. Send for booklet PA.

1128 NORTH MAIN STREET, PROVIDENCE, R. I.

NEW DEAD RECKONING EQUIPMENT

For Defense of Land, Sea and Air

AIR NAVIGATION TEXT with Dept. of Commerce Navigation Plotter. Necessary for Cross-country flights, and for Commercial and Instrument rating examinations. Difficult radius of action, Off-course and alternate airport problems plotted and solutions given in a simple understandable method similar to the text used in the U. S. Naval Academy, but improved. Book size 14x8½ in handsome red leatherette with gold letters. Plotter contained in patent cover pocket. Combination only $4.00 postpaid or C.O.D.

OUTSTANDING NEW AVIATION DEFENSE BOOKS

RADIO and INSTRUMENT FLYING: By Charles A. Zweng, Instructor, U. S. Air Corps. New 1941 Edition covering new important material. Written especially to prepare the pilot for government examination for "instrument rating." Radio-Telephone Permit included with Meteorology, Radio-Orientation, let-down, off-course and alternate airport problems. Only $4.00, postpaid.

FLIGHT INSTRUCTOR: A new text covering the scope of the written examination for flight instructor rating. New authentic Multiple Choice questions with answers included, $3.00, postpaid, or C.O.D.

CELESTIAL NAVIGATION—complete equipment consisting of, Air Navigation Note Book and Navigation Plotter, Simplified Celestial Navigation, Air Almanac, Line of Position Book, and Hlynes Star Chart all 6 items only $11.75 postpaid or C.O.D.

AERONAUTICAL TRAINING. New enlarged 1942 edition. For the first time shows separate sections containing Private Pilot and Commercial Pilot "Multiple Choice Examinations." Makes your government test easy. $3.00 postpaid or C.O.D.

GROUND INSTRUCTOR. Written for the student preparing for "Ground Instructor Rating." Excellent for class work. Covers Navigation, Meteorology, Aircraft and Theory of Flight, Engines and Civil Air Regulations. $3.00 postpaid or C.O.D.

GROUND INSTRUCTOR RATING. Off the press November 1st. Contains "Multiple Choice" examinations on Navigation, Meteorology, Aircraft and Theory of Flight, Engines and CAR. Nomenclature and aviation dictionary in back of book. It's new and different. Something you cannot afford to be without. $3.00 postpaid. Or it may be purchased in combination with "Ground Instructor" for $5.00.

AIRPLANE and ENGINE MECHANICS: Examinations. New authentic Quiz Book now covers the new Multiple Choice examinations fully illustrated with necessary diagrams. Used by Lockheed, Douglas, Northrup, Ryan and outstanding schools. Why fail? Only $3.00 for both examinations, and CAR.

AIR NAVIGATION (Gold Medal Edition) includes meteorology, $5.00 postpaid.

METEOROLOGY FOR PILOTS by Lt. Comdr. Halpine. Only $2.75 postpaid.

DALTON MARK VII AIRCRAFT COMPUTER: With book of instruction . . . $7.50.

Pan American Navigation Service

12021 Ventura Blvd. North Hollywood, Calif.

Airy Chat

(*Continued from page 8*)

a top speed of 404 m.p.h. at 16,000 feet, range of 1,070 miles at 350 m.p.h., etc. In addition, we learn that the P-38E now is in production as a two-place fighter. Other U.S. aircraft described in detail include the Consolidated B-24, Douglas A-20A, Martin B-26, North American B-25C, Consolidated *Coronado*, Martin *Mariner*—and even Consolidated's pseudo-secret Model 31, dubbed the Pregnant Guppy. That twin-engined flying boat, the first to appear with the Davis airfoil, the British say has a top speed of 285 m.p.h., a range of 7,000 miles at 220 m.p.h.

Undoubtedly these figures have been given Air Ministry officials during the course of military negotiations. It is natural that such should be the case. But the subsequent publication of such confidential data by the British aviation press prior to its removal from the restricted list in this country works a hardship on American writers and is a situation which might be clarified through an understanding between the American and British censorship authorities.

The Royal Air Force did a tremendous job on the RAF issue, as readers could easily see. But they also did a tremendous behind-the-scenes job that we hope some day to have in all its details. For instance, nearly every article about some far away theater of war actually was written there. Air Marshal Tedder wrote his article on the Middle East somewhere in Africa. Many photographs were prepared at the front. The color photograph "Desert Warrior" was taken in the Libyan desert, flown to London, then to us.

Every article was prepared in duplicate, even to the accompanying photographs. Each set of material then was dispatched aboard separate bombers, flying different routes. Finally, the veteran British editor to whom the Air Ministry assigned the task of supervising the assembling of the articles—A. Spenser Allberry—flew to Chicago from London to work with us in the final stages.

To Mr. Allberry, editor of London's famed "Bystander" for 28 years, is due much credit for the RAF issue.

We learned a lot, working with him.

* * *

And got darn little sleep.

MAX KARANT

END

Licenses

PREPARED as a special bulletin for FLYING, the following monthly statistics were released by the Civil Aeronautics Administration:

	August 1 1942	1941
Pilot certificates of competency	105,164	84,152
Student pilot certificates	112,113	91,294
Glider pilot certificates of competency	276	146
Student glider pilot certificates	458	534
Mechanic certificates of competency	16,272	13,041
Parachute rigger certificates of competency	751	484
Certificated aircraft	22,697	22,508
Certificated gliders	82	52
Ground instructors certificates of competency	6,543	3,739
Air-traffic control-tower operators certificates of competency	1,046	388
Air carrier dispatchers certificates of competency	488	413

CHARLES A. ZWENG
Formerly Instructor U.S. Army Air Corps
Gives you personal Instruction

PAN AMERICAN COLLEGE of CELESTIAL AIR NAVIGATION

(AFFILIATE PAN AMERICAN NAVIGATION SERVICE)

offers the student four aviation courses. Celestial Air Navigation, and ground courses covering Pilotage, Dead Reckoning, Radio and Instrument Flying, Aeronautical Meteorology, Aircraft, including Theory of Flight, Aircraft Power Plants and Civil Air Regulations.

CELESTIAL AIR NAVIGATION—This important field of Aviation has developed rapidly during the past year. Since the beginning of the second world war it has been apparent to the government that a critical shortage of air navigators existed. Immediately after December 7th, 1941, marking the actual beginning of the world war for the United States, the government began to survey the field and draw on navigation schools for air navigators and instructors. Airlines established Transition Schools for the purpose of practical advanced training. Former students of "Pan American College of Celestial Air Navigation" are now in various quarters of the world. Some are ferrying bombers to England and allied countries; others are instructing in the Army Air Corps or with Transition Schools for advanced training. Never before has navigation of the air offered such opportunities as the present.

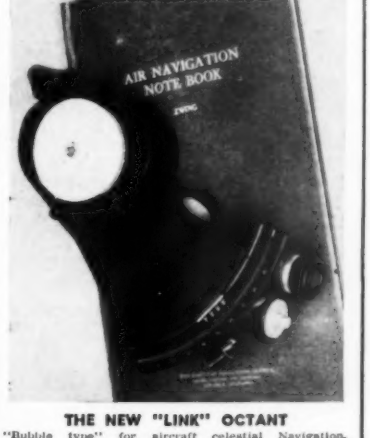
THE CELESTIAL COURSE—This course is under the personal supervision of Charles A. Zweng, recognized authority on Air Navigation and former Instructor in the U. S. Army Air Corps.

Air Navigation Equipment, including Aircraft Sextants, is under the technical supervision of Lt. Comdr. P. V. H. Weems, U. S. N. ret., outstanding American and British authority on Celestial Air Navigation, author of "Air Navigation (Gold Medal Edition) and "Air Navigation" (British Empire Edition).

For further information address

PAN AMERICAN COLLEGE of CELESTIAL AIR NAVIGATION

12021 Ventura Blvd. North Hollywood, Calif.



THE NEW "LINK" OCTANT

"Bubble type" for aircraft celestial Navigation. Price $262.50.

Equipment Recommended for the Student Beginning Study of Celestial Navigation:

Air Navigation Note Book with Navigation Plotter	$ 4.00
Simplified Celestial Navigation	3.00
American Air Almanac	1.25
Line of Position Book	2.50
Hlynes Star Chart	1.00
	$11.75

Order From

PAN-AMERICAN NAVIGATION SERVICE

AIR NAVIGATION EQUIPMENT

12021 VENTURA BLVD. NORTH HOLLYWOOD, CALIF.

The RONALD PRESS COMPANY

AVIATION Publications

FOR PILOTS, GROUNDMEN, STUDENTS, COLLEGES
AVIATION INDUSTRY, TECHNICAL SCHOOLS

4 AERONAUTIC RADIO
for Operators, Pilots and Mechanics
By Myron F. Eddy, Lieut. U. S. Navy Ret.; Memb. Inst. Radio Eng.; Chief Inst. Aircraft Radio, Stewart Tech. School. Prepares for Aviation License Exams. Covers Principles, Selection, Installation, Operation & Maintenance of Aeronautic Radio. Gives regulations of C.A.B.
502 pgs. 198 Illus. $4.50

5 SIMPLE AERODYNAMICS
and the Airplane
By Col. C. C. Carter, U. S. A. Ret., Prof. at West Point 1917-40. (5th Edition Revised.) Contains important information on the fundamental aerodynamics involved in the design & operation of airplanes. Enables beginners to secure basic grounding by Home Study.
510 pgs. 300 Illus. $4.50

6 PRINCIPLES OF FLIGHT
Mathematical Analysis of Practical Applications of Aerodynamics
By E. A. Stalker, Prof. Aeronautical Eng. Univ. of Mich. Intended primarily for engineering students who have completed a course in simple aerodynamics. The material does not proceed beyond a first course in calculus. Many theories are discussed and analyzed. A great amount of experimental data is included.
428 pgs. 311 Illus. $6.00

7 NAVIGATION OF AIRCRAFT
with Pilots' Dead Reckoning Tables
By L. C. Ramsey, Captain U. S. Navy, Former Chief Inst. Pensacola Ground School. (2nd Edition.) Different from any other book in its balanced treatment of all three branches, Piloting, Dead Reckoning and Aerial Astronomy. Concise, positive right to the point. Does not require the use of higher mathematics.
2 Vols. $4.50

8 AERONAUTICAL METEOROLOGY
By W. R. Gregg & Other Weather Experts. (2nd Edition.) This book gives knowledge which is important to Aeronautical Engineers, Transport Operators and Pilots and should be the equipment of everyone in the industry.
421 pgs. 126 Illus. $4.50

9 WEATHER GUIDE FOR AIR PILOTS
By E. L. Eaton, Aerographer U. S. Marines. A concise Manual. Especially designed for certificated and student pilots and airport & airline officials. An important book on various weather phenomena that has a direct bearing on flying.
74 pgs. 27 Illus. $2.00

10 ENGINEERING AERODYNAMICS
By W. S. Diehl, Comdr. Eng. Div. U. S. Navy, Memb. Com. N.A.C.A. (2nd Edition Completely Revised.) A Handbook for Airplane Designers. Incorporates a great mass of new material, digested and arranged in form for convenient reference and application. Concise, practical information on dynamics of airplane design.
556 pgs. 266 Illus. $7.00

11 AIRCRAFT PROPELLER HANDBOOK
By K. H. Falk, Chief Blade Designer, Hamilton Div., United Aircraft Corp. A condensed text of practical and useful information on the design of aircraft propellers. Treats various problems encountered in propeller work.
95 Articles 62 Diagrams $4.00

12 GLIDERS & GLIDING
By R. S. Barnaby, Lieut. Comdr. U. S. Navy, Bur. of Aeronautics. A thorough, progressive course in flight training with detailed information about types of gliders, required ground and wind conditions, maneuvering, etc.
182 pgs. 123 Illus. $2.50

MAIL COUPON FOR → 5 DAY EXAMINATION ←

THE RONALD PRESS CO., Publishers
(Established 1900) Dept. M662
15 East 26th St. New York, N. Y.

Mail books I have marked below. I will remit at prices shown (plus few cents postage) within 5 days after they are received or, if after examination, books do not come up to my expectations, I have the privilege of returning them within that time. (We pay delivery on orders accompanied by cash remittance, same approval privilege.)

CHECK OR CIRCLE BOOK OR BOOKS YOU WANT

1—☐ Air Piloting (A Manual of Flight Instruction) *by Simmons*.....$4.00
2—☐ General Aeronautics *by Lusk*.... 3.75
3—☐ Pilots' & Mechanics' Aircraft Instrument Manual *by DeBaud*.... 4.50

Number 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12

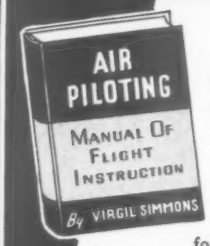
Name .....

Address..... * State.....

☐ Employed by
☐ or Reference .....
(Must be complete with address unless cash with order.)

☐ Check here for Catalog of Publications on Aeronautics.

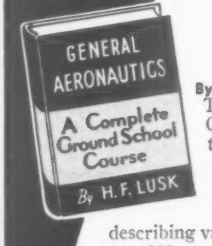
* Outside Continental U. S. remit with order at above prices plus 25 cents per book for shipping.



New, Revised and Enlarged Edition!
1 AIR PILOTING
A Manual of Flight Instruction
By VIRGIL SIMMONS, Flight Comdr., Spartan School; formerly with Boeing & U. S. Army and Navy.
Every beginner should read this widely used and complete 750 page manual before getting into a plane. Experienced pilots will find it filled with timely suggestions and new points needed to secure advanced ratings and greater skill. It gives you knowledge and facts from a man of more than 20 years' experience.

OVER 1,000 EXAM QUESTIONS
for All Grades of Pilot Certificates. Covers in detail all subjects relating to piloting of aircraft. An invaluable Step-by-Step Guide based on latest requirements of C.A.B. Over 160 illustrations and many diagrams.

5 DAYS' TRIAL—JUDGE FOR YOURSELF
Gives instruction in the Airplane and its controls, Primary flight training, Intermediate and advanced Maneuvers, Solo, Private and Commercial Piloting, Seaplane Flying, Meteorology, Navigation, Radio, Civil Air Regulations, etc. Many diagrams of maneuvers. Highly endorsed by Leading Airmen. **$4.00** Postpd.



2 GENERAL AERONAUTICS
A Complete Ground School Course in One Easy-to-Read Volume
By HILTON F. LUSK, Former Dean, Boeing School of Aeronautics
This Popular and Complete, Up-to-date, 530-page book Clearly & Thoroughly Explains all subjects You Need to Know to pass written Government C.A.B. exams for any pilot rating or for Aircraft Engine and Mechanic Certificates. Easy to understand.

CONTAINS 250 ILLUSTRATIONS & DIAGRAMS
describing various functions of Planes, Engines, Instruments. Gives over 300 typical Exam Questions. Meets need of Home Study, used as Text at many Ground Schools, Technical Institutes, Colleges, etc.

EXAMINE IT LEISURELY FOR 5 DAYS
Covers—Occupations, Flight Principles, Methods & Types of Construction & Operation, Theories of Lift, Engine Construction & Operation, Ignition Systems, Propellers, Navigation, Radio, Applied Meteorology, etc. How to Take Off & Land, Read Maps, Charts, Codes, Forecast Weather, Operate & Install Instruments, Safety Appliances, etc. **$3.75** Postpd.

3 PILOTS' & MECHANICS' Aircraft Instrument Manual
By CAPTAIN G. C. DeBAUD
U. S. Army Air Forces
This 500 page book equips the Pilot and Student with a Complete Understanding of How Each Instrument Operates; How it Performs during Actual Flight. Knowledge of the Functioning & Purposes of All the Numerous Aircraft Instruments is Important for everyone taking various Government rating tests.

320 ILLUSTRATIONS, PHOTOS, CHARTS, ETC.
This Home Study Book Steps Up the work of Installation, Calibration, Repair, Trouble Shooting and Maintenance of Instruments. An invaluable help in securing Mechanic's license.

SENT FOR 5 DAYS' EXAMINATION
GIVES A CLEAR EXPLANATION of the Carburetor and other Gauges, Thermometers, Cylinder Temperature & Aero Mixture Indicators, Tachometers, Autosyn Instruments, Turn & Bank, Rate of Climb Instruments, Radio Altimeter, Artificial Horizon, Gyro, Automatic Pilot, Octant, Sextant, Drift Indicator, Oxygen Regulator, Link Trainer, 1-2-3 Blind Flying System. **$4.50** Postpd.

THE RONALD PRESS COMPANY, Publishers
15 East 26th Street ESTABLISHED 1900 New York, N. Y.

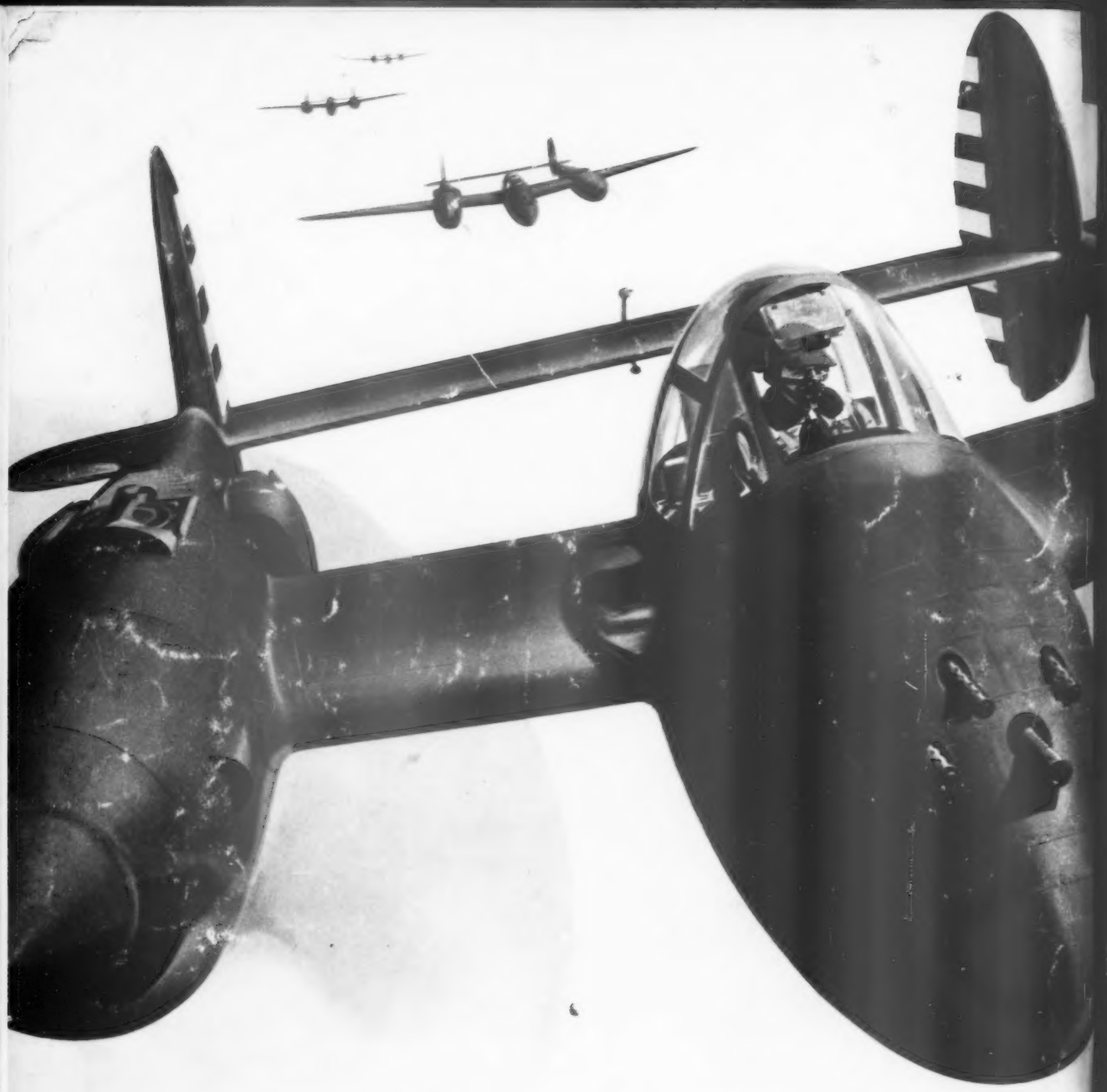
PRINTED IN U. S. A.

SAFEGUARD *to the present . . .*
GATEWAY *to the future*

The time-vault, with its flawless mechanism, protects man's most valued material possessions. So also America's powerful precision-built aircraft engines are today safeguarding the values that will make the future secure. As the gateway to tomorrow opens, we see the tonnage loads of commerce going by air—world progress for which Wright provides the power.

WRIGHT

POWER THE TONNAGE



So it's a fight they want...

They wanted a fight. They started it... 11 years ago in Manchuria...8 years ago in Ethiopia...3 years ago in Poland and nearly a year ago at Pearl Harbor. Behind smoke screens of diplomatic negotiation, they deployed for treacherous attack... geared their industries for destruction.

So prepared, they struck. Then... American industry abandoned hope for peace. As had the industries of Britain, America's factories accepted the grim challenge of total war...willingly.

That is why now, the aircraft industry of the United Nations builds great 'planes...of every type...and more of them than does the Axis. And Lockheed will *continue* to produce more and more Hudson bombers and Lightning P-38 fighters. Lockheed Aircraft Corporation, Burbank, California.

for protection today, and progress tomorrow, look to

Lockheed

FOR LEADERSHIP